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"What’s it gonna change?"

Real-time paediatric respiratory infection community surveillance: A qualitative interview study of clinicians’ perspectives on the use, design and potential impact of a planned intervention.

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A thesis submitted in partial fulfilment of the requirements of the University of the West of England, Bristol for the degree of Professional Doctorate in Health Psychology

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Abstract

**Objectives:** The aim of this study is to inform the design and development of an online surveillance intervention, which could have a role in improving the management of paediatric respiratory tract infections (RTI) in primary care, including aiding antimicrobial stewardship. The specific objectives are to assess the perceived utility of the intervention in principle, the potential impact in practice, and clinician preferences for the design, content and mode of delivery, identifying barriers and facilitators to intervention use.

**Methods:** Semi-structured one-to-one interviews were conducted with 21 clinicians (18 GPs; 3 Nurse Practitioners) representing a range of clinical experience from a range of Bristol GP surgeries (deprivation deciles 1 to 9). Interviews explored clinicians’ current approaches to managing paediatric RTIs, knowledge of circulating infections, and views of a mock-up example of local viral and syndromic surveillance information. Interviews were audio recorded, transcribed verbatim and analysed using thematic analysis.

**Results:** Clinicians agreed there is currently no formal primary care system for identifying circulating infections, and the surveillance information was novel and potentially useful.

While symptom duration was perceived as useful, there were mixed responses regarding the use and relevance of knowing community viral microbiology. Barriers identified include time pressures, information overload and lack of fit with clinicians’ perceived role as assessing each child as an individual and looking for risk. Clinicians tended to see a role for the intervention to aid patient explanations.

**Conclusions:** Whilst clinicians viewed the information as potentially beneficial for supporting consultations with parents, there were mixed responses to how knowledge of viral microbiology could or should inform their practice of treating each patient individually, with fear of missing the sick child as a key consideration. While some saw a use for the intervention in aiding decision-making, many only wanted information about risks to look for. There was a sense that current practice does not need to change, and that epidemiological information is not used as a starting point for decision-making in this context.

The findings have implications for intervention development (which will draw closely on the results), and more broadly for the field of medical decision-making.
Chapter 1: Systematic Review – an explanation

I wrote my systematic review on computerised cognitive behavioural therapy (cCBT) for depression, submitting this in June 2014. Now, over two years later, this research thesis takes as its focus the development of a community paediatric infection surveillance intervention, designed to improve primary care utilisation for children with respiratory tract infections (RTI) and improve antibiotic stewardship in this group.

I recognise that this is a leap of topic, and not the preferred plan for the research programme to be submitted for assessment for completion of the Professional Doctorate in Health Psychology.

As is the usual case within research employment, contracts are short, and it is often necessary to bring one’s research skills to new topics for the sake of ongoing employment. While this brings with it a lack of continuity of topic, it enhances the development of transferrable research skills, and the application of health psychology to new areas, drawing on themes that cut across different fields of research.

My systematic review topic was borne out of the understanding I gained in the field of cCBT from my previous research role as Research Assistant for the REEACT Trial of computerised cCBT for depression. Within this employment I had the extra role of acting as therapeutic telephone coach to support participants in their use of a cCBT program, MoodGym (www.moodgym.anu.edu.au), as well as interviewing some participants about their experience of using a cCBT program alone (without telephone support).

The possibility of harnessing the potential and wide accessibility of the Internet to bring low-cost therapy to a vast number of people is highly appealing. The claims of some of the online therapy programs - and researchers invested in the field – about the perceived benefits of the treatment were both appealing and, I felt, a little simplistic. I remember seeing a graph in a presentation by a particularly avid promoter of the technology projecting a linear relationship between cCBT technology improvements and population depression levels. I wanted to explore the efficacy of these programs in an unbiased way, and so this made a good topic for my systematic review. My findings from the trials I reviewed left a question mark over the
value of cCBT per se, suggesting that the human therapeutic support alongside the program was key to its positive impact; perhaps cCBT was beneficial in combination with therapeutic support, perhaps it had a role in improving efficiency by reducing the duration of therapy sessions required, or possibly it had little value to add to brief therapeutic support.

During much of my Doctorate, I worked within smoking cessation research, and spent time looking into online support for smoking cessation. I was keen to do some work towards developing a support to stop smoking app or online intervention specifically for people with depression, which I felt would bring together my knowledge, while addressing a key public health problem, and further my career in the field in which I was keen to continue working. As people with mental health problems are particularly over-represented amongst those who smoke, smoking cessation intervention efforts need to address the needs of this population. In a presentation I gave at the International Congress of the Royal College of Psychiatrist (2013), I urged psychiatrists to address smoking in their patients. In considering the topic, I wondered about the negative mental health impact of trying and failing to quit for this group, and found little research in the area. I began planning research to develop on this, starting with interviewing people with depression about their experiences of attending smoking cessation treatment and failing to quit, as this would be key to the net benefit of any efforts to reach this group, and would need to be addressed in any online (or other) intervention design. Unfortunately, while developing these research plans, I was unexpectedly made redundant from my role within smoking cessation, and had to quickly find new employment, leaving behind a difficult relationship with my previous line manager, who had been poised to support my smoking cessation research.

My employment as of February 2015, is as manager of a study investigating the feasibility of recruitment and retention of a community cohort of parents and children for paediatric RTI infection surveillance. Within this role I designed and developed an online data collection system (together with an IT team), for parents to provide real-time symptoms data when their child/ren developed RTI symptoms within the study, as well as setting up systems for collection of swab samples from symptomatic children for laboratory analysis. The broader aim of this work is to develop an online resource of locally relevant real-time viral and syndromic infection information for parent and clinician use. The intended impacts of the intervention are to reduce clinicians’ antibiotic prescribing through enhancing their diagnostic certainty, and to reduce parents’ unnecessary consultations for their children through normalising viral
illnesses. In line with my ongoing interests in online interventions, I took the opportunity to lead qualitative interview work with clinicians about the proposed intervention as the subject of my Professional Doctorate thesis.

Since taking on this work, I have now secured a role in directly developing the online infection surveillance intervention, to draw from the findings of the feasibility study and the stakeholder interviews. As such, my research portfolio, though to date apparently disparate, pulls together an ongoing theme of online intervention development, implementation and testing for behavioural changes to improve clinical outcomes. It is exciting to now be a part of efforts to reduce the growing problem of antimicrobial resistance, which is a rich field for the application of Health Psychology.
2 Chapter 2: Introduction and background literature

2.1 Scope of the problem

2.1.1 Primary care, antimicrobial resistance and antibiotic prescribing

General practitioners' (GPs) workload and intensity is increasing as primary care has seen a rise in consultation rates (without corresponding increase in GP staff time), and increased complexity in patient cases over recent years.¹

In addition to this growing burden on primary care clinicians, there is a growing public health threat of increasing antimicrobial resistance (AMR). Warnings of this burgeoning global public health threat are not new, with the first World Health Assembly AMR resolution agreed in 1998². Modern medicine relies on the ability to treat infections. The effective application of antimicrobial treatment underpins HIV treatment, caesarean section and major surgery, organ transplants and cancer treatments as well as the treatment of infectious illnesses themselves. Despite the near twenty year call for action, the rapid advancement of new infectious diseases has not been matched by the advancement of new antibiotic formulations, as the microbial organisms (bacteria, fungi and viruses) that cause infections have evolved to develop resistance to the antimicrobials that we have. This is a threat to public health on a global scale, with increasing numbers of people at risk of disability and early mortality from once treatable illnesses. The Chief Medical Officer (CMO) report of 2011³ called for antimicrobial resistance to be put on the national risk register, and called for greater infection surveillance, and two years later, the CMO report reiterated the urgency of the problem³.

While antimicrobial resistance refers to multiple microorganisms (bacteria, fungi, viruses), and widespread antimicrobial treatment that leads to resistance includes animal and plant treatments, it is the bacterial resistance developing in response to human treatment with antibiotics that is the major concern,⁴ and the leading cause of this global problem is attributed to the over-prescription of antibiotics.⁵

Primary care is responsible for 80% of all antibiotics prescribed.⁶ Costelloe et al’s (2010) systematic review and meta-analysis⁷ showed that antibiotic prescribing in primary care led to the immediate development of resistant bacteria within each patient, lasting up to twelve
months. The authors conclude that this leads to both an increase in the population of resistant bacteria, and in the use of second line antibiotics. Convincing evidence exists for the widespread unnecessary prescribing of antibiotics for viral infections that (by definition) will not respond to antibiotic treatment.\textsuperscript{8,10}

An additional problem is that the inappropriate prescription of antibiotics can encourage people to consult for similar symptoms in future. This may be due to an attribution bias whereby patients interpret the natural symptoms resolution of a self-limiting illness to result from taking the antibiotics they were prescribed, and therefore are more likely to seek healthcare again for similar symptoms.\textsuperscript{11} This in turn contributes to the primary care workload, as well as reinforces the cycle of inappropriate prescribing, with evidence showing that patients receiving antibiotics are more likely to re-present\textsuperscript{12} and practices that reduce their prescribing reduce consultation rates overall.\textsuperscript{6}

2.1.2 Respiratory Tract Infections (RTIs)

Respiratory tract infections (RTIs) are the most common problem managed by primary care with the majority occurring in children,\textsuperscript{13} representing a significant primary care burden.

The use of primary care services for RTIs and antibiotic prescribing are inseparable as 60% of all antibiotics are prescribed for RTIs,\textsuperscript{14} and 54% of patients presenting to primary care with RTI are given antibiotics.\textsuperscript{15} These are alarming numbers, and most of these illnesses are self-limiting for which antibiotics will be ineffective, or at best, reduce symptoms duration by only one day while also increasing negative side effects.\textsuperscript{16,17} Though the risk of complications from infections is a common clinical rationale for prescribing, new research suggests that a broad-level reduction in primary care antibiotic prescribing for RTI is a safe approach in terms of its nil to minimal impact on the incidence of common infection complications.\textsuperscript{18}

2.1.3 Paediatric RTIs

Children experience on average six to eight RTIs annually and NHS costs and costs to parents for paediatric RTIs are significant.\textsuperscript{19} These large numbers recommend this clinical group as a key target for intervention development, as even a small change in consultation rates and improved management of paediatric RTI, including the targeting of antibiotic prescribing, could
have a significant impact on primary care resources and help reduce the growing threat of AMR.

Improving the use of primary care services and antibiotics for children with RTIs has arisen as a research priority regionally and nationally in response to:

i. Priorities identified by patient and public involvement (PPI) work conducted in Bristol with parents and NHS commissioners as part of the ‘Respiratory Infections Health Integration Team (HIT)’

ii. Regional and national Clinical Commissioning Group (CCG) priorities (to promote self-care and improve the use of NHS services for minor illness in children)

iii. The Department of Health UK Five Year Antimicrobial Resistance Strategy and Action Plan: 2013 to 2018, and


2.1.4 A call for behavioural interventions

Although antibiotic prescribing in primary care has reduced over the last year, there is more work to be done. Guidelines for the appropriate targeting of antibiotics – particularly in recommending against prescribing for RTIs – have been widely available for years, though as we have seen, ‘inappropriate’ prescribing for RTIs continues, which indicates that research efforts and interventions need to build on the straightforward provision of advice.

A key 2015 report by Public Health England (PHE) and the Department of Health calls for behavioural interventions to improve the management of RTIs and reduce antibiotic prescribing in healthcare settings, emphasizing the multi-factorial nature of the problem, requiring multi-disciplinary approaches, and calling for interventions to take account of the complexities of the context, process and contributing factors of the over-prescription of antibiotics in primary care.

2.2 The context of RTI management in primary care

The process and context of diagnosis, management and prescribing in primary care is complex with many influencing factors, including, but not limited to; knowledge and understanding of infections and appropriate antibiotic use; awareness of AMR risks, responsibilities and
personal relevance; the roles occupied by GP and patient, and carer; the different expectations and concerns brought into the consultation; risk assessment and management; diagnostic confidence; broad level public health concerns versus the focus on one individual presenting within a consultation, and all this is the context of time and resource pressures of primary care work.

2.2.1 Cultural roles within the consultation

On a cultural level, the doctor’s role is an active one in terms of treating illness – and ingrained into this active role is the production of an action plan, traditionally exemplified by the issuing of a prescription, while the patient classically holds a help-seeker role, which reinforces this activity, and a prescription can been seen as symbolically representing the successful culmination of the interaction of these roles. For a doctor to choose not to prescribe represents an unsatisfactory outcome in the context of this cultural model of the interplay of the roles.

The role of the doctor is also of a caregiver looking after one individual within the interaction. In the context of the one-to-one clinical interaction, the broader context of public health concerns may not seem relevant. Additionally, many GPs tend to perceive AMR as a global problem, but one that is caused by other countries, patients or other healthcare providers, rather than themselves.

The child is socially constructed as holding a vulnerable role, which heightens risk-averse behaviour. In the context of acute RTI illness, this can lead parents and clinicians to be more likely to take action (parents to consult; doctors to prescribe) to reduce or remove a health threat, and importantly also to be seen to be taking protective action rather than taking risks with a child’s health.

2.2.2 Fear of not prescribing

A main contributing problem towards the over-prescription of antibiotics is that of fear of the negative consequences of not prescribing. A perception of the risk of complications or worsening health can lead many GPs to prescribe ‘just in case’ with antibiotics representing an easily accessible and cheap risk management tool to use in this context. The
fear element is particularly pertinent in the case of children (in the context of their cultural role as vulnerable), with the fear of missing treating a child leading to their worsening health being a strong and emotionally-laden behavioural motivator, particularly when such cases are widely reported in mass media, giving this fear extra salience.

2.2.3 Patient expectations

Interestingly, doctors’ perceptions of patient expectations have a far larger role to play than patient expectations per se. Doctors are more likely to prescribe if they have a perception that their patient expects or desires antibiotic prescription, even though many patients, and parents do not want antibiotics.

Additionally, there is evidence that doctors perceive patients are more dissatisfied in the absence of a prescription, and doctors’ fear of this negative consequence is another driver of over-prescription (including fears around losing patients), though interestingly, patient satisfaction is not related to receiving a prescription per se, but being given an explanation of the illness and the doctor’s decision.

2.2.4 Cognitive biases

GPs are under pressure to make complex clinical judgments in very limited timeframes. Previous research shows that GPs’ diagnostic decisions are by no means immune to the suite of cognitive biases that can influence most people’s logical reasoning, including the availability bias, confirmatory bias, anticipated regret, anchoring and adjustment and representativeness.

Anchoring and adjustment means assessing new cases in relation to a previous case, rather than a population baseline. For example, assessing a sick child by comparing them to the last sick child seen, rather than as a new case to be assessed against a broader population baseline.

Confirmation bias means selectively gathering and interpreting evidence to confirm a diagnosis, and ignoring evidence that may disconfirm it.

The availability bias means that information that is more easily recalled is given more importance. This means that information that is more salient will have a larger impact on
decision-making than information that is harder to recall, regardless of the informational quality of the evidence. Features of information that make it more salient and available are if it is; frequent, recent, unusual (such as rare medical cases), emotive (such as a memory of a child deteriorating when not offered antibiotics), or high profile (such as media reporting of a child deteriorating after seeing their GP). Research shows that even simply *imagining* a diagnostic outcome will raise a clinicians’ subjective probability of its likelihood.\(^{37}\)

**Anticipated regret** means that the probability of a diagnosis with a more severe possible outcome is overestimated due to a heightened sense of future regret in the event of missing the diagnosis.

**Representativeness** is about flatly assuming that what is seen in clinic is representative of a ‘real’ state of events, which can take many forms including: i) not accounting for regression to the mean by assuming that the acute symptoms measured within the consultation are representative of the illness, rather than an anomalous peak; ii) assessing only by the similarity of symptoms with possible diagnoses, and ignoring relevant base rate probabilities of diagnostic options; iii) the gambler’s fallacy of reasoning that sequential cases represent the full spectrum of diagnostic probabilities, whereby, for example, after four similar successive cases given diagnosis A (80% probability), similar case number five is given diagnosis B (20% probability), rather than being assessed independently as having 80% probability of diagnosis A.

All of these biases can come into play in the context of paediatric RTI management.

### 2.2.5 Non-clinical factors

We also know that large variation in intra-clinician antibiotic prescribing occurs, with antibiotics being more likely to be prescribed on a Friday\(^{38}\) or over the weekend\(^{39}\) rather than on weekdays. Antibiotic prescribing for RTIs is also influenced by many non-clinical factors including environmental,\(^{40}\) clinician\(^{41}\) and patient\(^{42}\) characteristics, and where paediatric RTI is concerned, prescribing is influenced by GP perceptions of parent competence and self-efficacy for illness management.\(^{28}\) Many of these effects are attributed to greater uncertainty.
2.2.6 Uncertainty

The diagnostic process can be characterised as reasoning about uncertainty, as it is not possible to reach total diagnostic certainty with the resources, time and knowledge available to primary care clinicians. This means the clinician’s role is to reach an acceptable likelihood of the accuracy of their diagnosis and appropriate management based on the evidence available.

The 10-fold variation in the number of consultations for RTIs between GP practices, along with the variation in antibiotic prescribing between clinicians and GP surgeries is thought not to be attributable to variation in the cases and clinical factors seen by different surgeries, but to suggest uncertainty for parents regarding when to consult and uncertainty for clinicians regarding diagnosis and effective treatment of RTIs in primary care. In fact, diagnostic uncertainty was identified as a key driver of antibiotic over-prescription in a recent systematic review of antibiotic prescribing behaviour.

GPs tend towards prescribing antibiotics in the face of uncertainty for paediatric RTIs, due to a perception that not prescribing carries greater potential threat. The authors conclude that clinician interventions to reduce unnecessary antibiotic prescribing in this group should increase confidence in the safety of not prescribing - as an adjusted social norm for GPs to align their prescribing behaviour. Research also calls for more detailed evidence around paediatric RTI prognosis to reduce uncertainty.

2.2.7 Diagnostic decision-making: thinking systems and the role of probability

The mental process of arriving at a clinical diagnosis (in particular, and decision-making in general) in the context of uncertainty is described as involving two approaches – or thinking ‘systems’. System one represents a global ‘snap’ judgement based on intuition, experience, emotions or ‘gut feeling’ (e.g. a child walks into the room and the GP has an instant feeling-based response as to whether they are concerned or not), while system 2 is characterised as a conscious, analytical assessment of available evidence, taking into account specific clinical signs (e.g. taking temperature, pulse, listening to chest) as well as baseline probabilities of possible diagnoses. Recent evidence from Horwood and colleagues shows that the process of paediatric RTI diagnosis adheres to the two system thinking process. Logical reasoning should then follow to reach a decision with an outcome of highest “expected utility” – i.e. the perceived best outcome when assessing relative risks and benefits of actions in the context of an assessment of the evidence available.
The diagnostic reasoning process should take into account the Bayesian probability of a diagnosis based on a prior understanding of illness prevalence, such that a more common condition is, by definition, more likely to be the diagnosis than one that is rare. This means having a sound awareness of the baseline prevalence, or having access to it, as well as being able to update the likelihood or probability of a diagnosis, prognosis or treatment outcome in an individual based on the evidence gathered.\(^{48}\)

Bayesian (probabilistic) reasoning is a part of the system two logical processing that contributes to reaching a likely diagnosis and management plan. In the context of paediatric RTI, system two thinking would be less likely to lead to antibiotic prescribing due to a reasoned assessment of likely outcomes. System one is automatic, affective, and the default or ‘easy’ position. System one thinking is currently more likely to lead to antibiotic prescribing for RTI symptoms in the context of the cultural roles within the consultation, the fear of not prescribing, and is exacerbated by clinical uncertainty.

Djulbegovic and colleagues\(^{49}\) explain how this dual process model incorporates some of the common cognitive biases that affect medical decision-making, describing how system one thinking may take into account different diagnostic options, but gives them all equal probability; whereas an assessment of the relative probabilities of different diagnoses or treatment outcomes is a function of system two thinking. A clinician is more likely to access system one thinking when under time and resource pressures, when certain information is more salient or available, when information about probabilities and outcomes are ambiguous, when severe negative prior outcomes are recalled, and when previous experiences are accessible, all of which are features of routine clinical practice. The authors focus in particular on the impact of anticipated regret of a negative outcome on the probabilistic reasoning process. In the case of prescribing to children, the anticipated negative outcome is particularly emotive, salient and fear-based, and so the anticipated regret looms large in decision making.

Heightened uncertainty and heightened fear leads towards a greater likelihood of system one or emotional reasoning, suggesting that a means to address the over-prescription of antibiotics for paediatric RTI is to reduce uncertainty, enhance diagnostic confidence and boost system
two thinking. It is possible that this could contribute, over time, to the automatic (system one) approach being to be less likely to prescribe than it is currently.

Evidence shows wide variability in pre-test probability estimates in clinicians,\textsuperscript{50} \textsuperscript{51} which inevitably impacts on diagnostic and treatment accuracy, with recent research suggesting that practice variation in prescribing rates could be in part due to differences in subjective judgments of disease prevalence\textsuperscript{49} – or the baseline probability (a key part of system two thinking). To aid best medical judgement, clinicians are recommended to consult epidemiological sources and relevant databases as the starting point of the reasoning process, and these need to be accurate and available.\textsuperscript{48} \textsuperscript{51}

2.2.8 Patient informational needs

In addition to recommending clinician interventions designed to reduce clinical uncertainty regarding social or clinical outcomes, Lucas and colleagues\textsuperscript{29} also highlight the need for clinicians to clarify parent motivations to prevent the misinterpretation of parental concerns for medical advice as a request for a prescription. Cabral and colleagues found that parents’ information needs are not met in most consultations with clinicians in terms of understanding their child’s illness, appropriate care for their child, and when to consult.\textsuperscript{52} \textsuperscript{53} Parents find that commonly used general microbiological diagnoses (e.g. “it’s just a virus”) in the absence of microbiological evidence undermine clinician credibility,\textsuperscript{54} and while tending to understand that antibiotics will not help viral illnesses, they hold a perception that severe symptoms need antibiotic treatment.\textsuperscript{55}

Where GPs tend to perceive patient dissatisfaction arising from not prescribing, research shows that parents are generally satisfied if such a decision is explained to them.\textsuperscript{56} Enhancing communication about not prescribing, in particular addressing lay beliefs that illness severity is a marker of the need for antibiotics is recommended for interventions to reduce patients’ expectations for antibiotic treatment.

Priority areas for behavioural interventions identified by the PHE report\textsuperscript{25} include: “addressing the fear of consequences of not prescribing (emotion) [...] and developing skills to
communicate this during consultations” and “enabling GPs to not issue a prescription (at least an immediate one)” (p.53)

An intervention that reduces the uncertainty around paediatric RTI diagnosis as well as enhancing patient explanation and parent information needs within the consultation could be a useful tool to improve the management and antibiotic stewardship for this prevalent clinical group.

2.3 A planned infection surveillance intervention

An online intervention of real-time surveillance data on locally-relevant community paediatric RTIs is planned, and being developed. The information presented would be a summary based on recorded surveillance data (not individual patient level), showing the most prevalent viruses (by geographical area) identified from community swab samples, and the main symptoms associated with these. Widespread population internet connectivity has great potential for enhancing our knowledge and management of circulating infectious illnesses through community participation in illness surveillance (via real-time online symptoms self-report), and 98% of families have internet connectivity. This surveillance approach has been successfully applied to influenza in adults – for example Gripenet and the FluSurvey project, though the majority of this work to date has been based on symptom self-report, and lacks associated microbiological data to identify circulating pathogens, which is the key component of the proposed intervention.

Many interventions aiming to enhance paediatric RTI management (including the provision of guidelines, algorithms, patient leaflets, education, clinician training and feedback) have been tried and tested, with varying results. Paediatric respiratory infection surveillance information is not currently routinely available in primary care, and presenting this information as an intervention is a novel approach, with potential for improving the management of paediatric RTI in primary care.

2.3.1 Potential mechanisms of intervention effects

2.3.1.1 Bayesian reasoning

The main theory is that increasing knowledge of prevalent locally circulating viruses, evidenced by microbiological surveillance has potential to enhance diagnostic confidence in viral causes of RTIs presenting in primary care. In addition to a general increase in awareness and
understanding of viral symptoms, duration and prevalence over the year, which could boost diagnostic certainty from a broadly educational perspective, the surveillance intervention has a particular aim of aiding Bayesian reasoning in this context. If a virus with a particular syndromic presentation is shown to be highly prevalent in real-time and within the local area, it should raise the pre-test probability of the illness which, via Bayeisan reasoning, may help a clinician assess that a child presenting with similar symptoms is likely to have the virus themselves.

In terms of aiding Bayesian reasoning by understanding pre-test probability, epidemiological evidence needs to be sourced, though often what is available is out of date, related to a specific population that may not be relevant, or the probability information is not presented in a way that is applicable to assessing population probability which means this is no easy task. Epidemiological sources for the clinician to draw on for a good sense of baseline probability need to be up-to-date and as relevant as possible by being representative of the clinical and non-clinical aspects of the patient population. Real-time infection surveillance information from the local community represents the highest level of relevant epidemiological evidence to aid clinical reasoning.

2.3.1.2 Patient explanation

The intervention would have clinician-facing information and distinct parent-facing information. The clinician-facing element is the focus of this study (while the parent-facing element is being developed in parallel). It is hypothesised that such an intervention will increase clinician confidence regarding the targeting of antibiotic prescribing and need for secondary care referral when children present with RTI symptoms. It may also improve clinicians’ ability to reassure patients, going beyond ‘it’s just a virus’, which could lead to more satisfactory outcomes. While the aim of the specifically parent-facing intervention would be to reduce consultation rates by potentially increasing parent confidence to manage RTIs at home, the clinician-facing information, if shared with the parent within the consultation, may have additional potential as a resource to offer instead of prescribing antibiotics – i.e. a form of taking action (as per the GP role outlined above), that is not prescribing, which could reduce antibiotic prescribing rates. Given that clinicians’ prescribing is influenced by their perceptions of patients’ expectations for antibiotics, the intervention could offer a tool to use in
expectation management, which may also impact on antibiotic prescribing and possibly even reconsultation rates.

2.3.1.3 Cognitive bias impact (system one)

It is also possible that with regular access to, or reminders about, the surveillance information, an intervention of this kind may impact via the cognitive biases that influence decision-making in an automatic (system one) way including: a) the availability bias; by being available, presented regularly and therefore easy to recall, surveillance information may have a role in balancing judgement away from the salient (fear-based) emotive cases that can motivate over-prescription; b) anchoring and adjustment; the intervention could help clinicians make diagnostic opinions relative to the baseline of circulating viruses rather than the previous children seen in clinic; c) confirmation bias; the intervention could mean that clinicians approach the assessment of children’s cases as confirmation of the viral illnesses presented online in the first instance. All of these mechanisms may lead to increases in viral diagnosis and subsequent reduction in antibiotic prescribing.

2.3.2 Intervention as a response to research recommendations

Several evidence-based recommendations for interventions to improve paediatric RTI management and reduce antibiotic prescribing have been outlined above (increasing confidence in the safety of not prescribing, providing more detailed prognostic evidence to reduce uncertainty, consulting epidemiological sources to start the reasoning process, enhancing communication about not prescribing to reduce expectations for antibiotic treatment) which this intervention could address.

In addition, the PHE report draws on the COM-B model to identify key recommendations for intervention development. Of these, the key areas that this intervention potentially addresses are:

i) **Automatic motivation**: Reducing uncertainty and therefore reducing the fear of not prescribing

ii) **Physical opportunity**: environmental organisation to make it easier not to prescribe antibiotics, with GP resources to support their decision not to prescribe.
2.3.3 Intervention development

A feasibility study of paediatric RTI surveillance is underway, within which this qualitative study is nested. With the intervention already planned, based on a broad idea of aiding Bayesian reasoning, the intervention and its theoretical underpinning are still in the developmental phase.

In terms of the design and evaluation of any intervention with a behaviour change aim, key frameworks emphasise the importance of using theory to inform the intervention design\textsuperscript{62,63} and the importance of an iterative programme of research and stakeholder contribution to intervention development and testing to maximise its success and applicability to testing in a full randomised controlled trial.\textsuperscript{64} Vodicka and colleagues\textsuperscript{65} conducted a systematic review of interventions designed to reduce antibiotic prescribing for paediatric RTI in primary care and recommended that interventions in this area need to address both clinician and parent needs and involve GPs in its design.

In this context, it is important to add to the evaluation of the feasibility of data collection for the content of the intervention, by gathering and analysing information to inform the design, delivery, utility and potential impact of such an intervention, and to begin to assess and develop the underlying theory. Figure 1 shows the full programme of intervention development work within which the present study fits.

\textit{Figure 1: The research programme for infection surveillance intervention development}
Gaining the views of primary care clinicians around the utility, design and perceived impact of the proposed intervention will be key to its effective design and implementation. It is particularly important to explore how the intervention may fit (or not) within the context of current clinical practice for paediatric RTI and how it can best be developed to meet clinicians’ needs and priorities. In addition, the theoretical assumptions underpinning its design need to be checked.

2.4 Objectives

The key objectives of this research are to gain the views of primary care clinicians to inform intervention development. Specifically, the research aims to understand:

1. The perceived utility of the intervention in principle, with a particular interest in how the intervention may fit (or not) within the context of current clinical practice for paediatric RTI
2. Clinician preferences for the design, content and mode of delivery of the intervention, to identify barriers and facilitators to intervention use, and inform optimal development to meet clinicians’ needs and priorities

3. Perceptions of the potential impact of the intervention in practice, with a particular interest in testing the hypothesis of the intervention impacting on diagnostic confidence, and enhancing patient explanation, while also inviting perceptions of unintended consequences

These main objectives formed the basis of the topic guide developed for clinician interviews.

2.5 Methodology

It is important to explore the acceptability of an intervention in principle, using qualitative methods, to inform the design and development of a future intervention at the pre-trial stage. Of particular relevance are Yardley and colleagues’ recent (2015) recommendations for a person-based approach to the development of digital interventions to promote health-related behaviour change, which advise not only to conduct in-depth qualitative work at every stage of development and testing, but also to present paper versions of potential web page designs to enable stakeholder consultation in advance of launching into software development with programmers. This latter recommendation forms a key part of the design of this research.

A qualitative investigation is warranted because an intervention like this relies on certain assumptions (e.g. that clinicians would engage with it; that it would increase confidence in diagnosis and management; that an increase in confidence would lead to improvements in prescribing and referral). It is important to explore the detail of the meanings in context of the proposed intervention before it is developed as: a) the assumptions inherent in the intervention design and purpose may be challenged; b) there are likely to be relevant factors that emerge that were not anticipated, and therefore would be missed by quantitative research; c) the design of the intervention needs to take account of the complex clinical context, the exploration of which needs a richer understanding than quantitative research would be able to provide; d) there may additionally be unidentified unintended consequences.
of a potential intervention, which qualitative research is able to explore and identify at the developmental (pre-trial) stage.

The focus of interviews were structured around identifying current clinical context, and gathering perceptions on the content, design, use and potential impact of the intervention on diagnosis and management, to feed into its development. Although this incorporates a largely deductive approach which could recommend a systematic framework analysis, the thematic approach was chosen to allow flexibility for inductive identification of emerging themes also.

This research is looking into the clinical context and systems in existing practice, checking pre-existing assumptions and themes while allowing for new themes to be identified. The aim is to reach understanding of key areas to aid a pragmatic approach to intervention development, gaining an overview of themes across GPs rather than rich individual stories. This means the research lends itself to a thematic methodological approach, rather than a more biographical case study approach like narrative analysis or individual perspective approach like interpretive phenomenological analysis, or the total bottom-up approach offered by grounded theory.68

2.6 Benefits of the research:
This research will provide new evidence regarding clinician attitudes to, and perceptions of, a potential future intervention (that includes real-time enhanced community RTI microbiological surveillance) to modify and improve the use of NHS services for children with RTIs. The evidence will be used to inform the design and delivery of the intervention for testing within a future randomised controlled trial (RCT).

2.7 Potential limitations of the research:
It is to be noted that some of the features of the causal pathway of intervention effects are unconscious processes, and that clinician interviews are focused on perceptions of the impact of a future intervention, which is likely to elicit a conscious and reflective processing of the information. These aspects mean that interviews can be useful to check and enhance the underlying theory, though it is important to be aware that clinicians are likely (by definition) not to be conscious about - and therefore able to access and talk about - their unconscious processes in this context. For this reason, the clinician interviews will form an important part
of the larger body of mixed methods developmental work (as outlined above) designed as a whole to contribute iteratively to the theory and development of the proposed intervention.

2.8 Health psychology context

This research adds to the field of health psychology by bringing detailed considerations of the psychosocial context, and clinician perspectives to the development of a clinical intervention designed to address prescribing behaviour change in the primary care context. In doing this, the work promotes the importance of bringing a health psychology perspective into intervention development to maximise the potential future benefits of implementing it in practice.

The findings will have implications not just for the specific development of this intervention, but also in understanding the context of clinician prescribing behaviour and the barriers and facilitators to change this behaviour, as well as the barriers and facilitators to intervention integration into the clinical context, drawing on the well-established health psychology COM-B model, as well as medical decision-making literature.

3 Chapter 3: Preparatory work

3.1 My role in context

I am employed as the manager of the EEPRIS study – Evaluation of Enhanced Paediatric Respiratory Infection Surveillance. EEPRIS is a prospective feasibility cohort study inviting parents to contribute symptomatic data online when their child/ren develop common respiratory tract infections (RTIs) – to include coughs, colds, sore throat, chest and ear infections. The study also involves taking symptomatic swabs (nasal and saliva) once an infection is confirmed (and asymptomatic comparison swabs on recovery) for microbiological analysis, with a main aim of broader (community population) level viral detection (rather than individual diagnosis). EEPRIS is collecting data on the practicalities of the paediatric RTI surveillance processes that would be a key part of the online intervention. The feasibility and acceptability of recruiting and retaining a community cohort of children to contribute symptom and microbiological data are the key outcomes.
The EEPRIS study contributes feasibility evidence around collecting community infection data for a surveillance intervention. The findings of this study will inform the key data collection methods that will contribute to the content of the intervention.

Alongside the feasibility study and this clinician interview study, a parent interview study is being conducted to gather parents’ experiences and views about taking part in infection surveillance as well as their views regarding a potential parent-facing online intervention.

The results of the feasibility study and both qualitative studies will be drawn on for developing the intervention to be tested in a pilot randomised controlled trial. I will take the lead role in coordinating intervention development, between January and March 2017.

3.2 Collaborators

Dr Tim Moss is my Director of Studies at University of the West of England, acting as thesis supervisor, advising on the health psychology aspect of the project. In addition to Tim’s support, I have colleagues allied to this research as follows:

Dr Isabel Lane, a GP registrar on academic placement within the wider infection research team at the University of Bristol is a collaborator on the project, as she developed the example materials showing microbiology and symptoms data (on paper) to present to GPs to aid interview discussion. Her ongoing work at the university is to aid the intervention development via conducting a systematic review of surveillance interventions, and offering clinical expertise for the intervention content. She conducted some of the later interviews, after discussion with me and using the topic guide I developed. She also independently coded a portion of the clinician interview transcripts for comparison with my coding frame as a reliability check to aid robust analysis, and coded the final transcripts based on my finalised coding frame.

Dr Christie Cabral is a member of the wider infection research group in which I work. She has expertise in qualitative research in antibiotic prescribing and RTIs in primary care, and has acted as a consultant for advice on relevant research and findings.
Dr Joanna Kesten is the qualitative researcher conducting interviews with parents about the parent-facing aspect of the intervention as well as their experiences of contributing infection surveillance data to the (EEPRIS) feasibility study. The findings of clinician interviews and parent interviews are closely related, so we have discussed the focus of our interviews together as well as results.

Professor Alastair Hay is the Principal Investigator for the main EEPRIS feasibility study. The planned online paediatric RTI surveillance intervention is his idea, and as such he acts as a consultant for advice on the interview results and what they mean for future intervention development.

During the course of this research development, I have chaired four group meetings with the above collaborators in addition to having one-to-one meetings with my Director of Studies.

3.3 Patient and public involvement (PPI) – for topic guide development

The topic guide was originally based on an outline of key areas of interest informed by components of the Normalisation Process Theory (NPT)\(^69\). The NPT is a model which can be used to evaluate the implementation of complex interventions. In this case, the first three of the four NPT components are of relevance: i) Coherence – the perceived meaning of the intervention (i.e. does the intervention make sense to clinicians, is it perceived to be of value, does it align with overriding goals and activities?); ii) Cognitive participation – the commitment participants are willing to make (i.e. are clinicians prepared to invest in the intervention? What are facilitator and barriers to its use?); iii) Collective action – the effort that participants will make in response to an intervention (i.e. what perceived effect will the intervention have on clinicians’ consulting and prescribing behaviour, is it consistent with existing practices? Feasibility and efficacy of the intervention in practice; commitment to using existing sources of information about circulating illnesses). The fourth component of NPT; Reflexive monitoring, is not thought to be relevant as this is a reflection on the intervention once it has already been in place for a time.
3.3.1 Focus group

To gain a preliminary response to guide the qualitative work, I co-conducted with Dr Lane an informal focus group discussion to discuss the materials and wider aims of the project with eight GP registrars at Southmead Hospital. Dr Lane was a part of this group within her role as clinical registrar, and so arranged for the meeting to take place. This preliminary work aided the development of the topic guide for the clinician interviews by highlighting the necessity of exploring the context of GPs’ current approach to diagnosis and management of RTI. The GPs questioned the relevance of differential diagnosis of RTI (the improvement of diagnosis being a key purpose of the intervention), when they perceived their role as primarily concerned with management of the sick child. In this context, the GP registrars questioned the relevance of microbiological information, as well as discussing the use of non-clinical information to inform patient management.

This work led me to expand the interview topic guide to ask GPs in more detail about their current practice in diagnosing and managing paediatric RTI before discussing the intervention and their perceptions of its use and impact in context. I felt this enhanced the quality of the data collected. Asking for clinicians’ responses to a planned intervention with mock-up materials is likely to lead clinicians to want to respond positively, even when encouraged to give uncensored opinions (positive and negative). By beginning with a more detailed discussion of the clinical context and decision-making, I could then cross check their responses to the intervention against their self-reported current practices, and ask about the fit.

3.3.2 Theoretical advice

I gave a presentation on the main EEPRIS study in December 2015, at the annual meeting of the NIHR Health Protection Research Unit (HPRU) who fund the broader project. The presentation piqued the interest of Professor Susan Michie, Health Psychologist from University College London, in the ongoing intervention development.

In recognising the potential for the research to be enhanced by drawing on Michie’s expertise, I arranged a meeting with Susan Michie and her Research Associate in behaviour change,
Natalie Herd, together with the research collaborators (see above), in which we discussed the intervention and the assumptions around its integration and potential impact.

Michie advised on modelling the causal pathway of the intended behavioural outcomes of the intervention, together with potential barriers and facilitators to the desired outcomes. Based on the information I had originally written around the aims of the intervention and our group discussion, Michie and Herd produced a model pathway, drawing on the COM-B model \(^70\) (see figure 2).
Figure 2: Model and structure of potential barriers to desired outcomes of intervention:

This added to the NPT modelling originally drawn on for developing the topic guide, by providing a model more specifically structured around the intervention of interest. I adapted the topic guide slightly to more explicitly incorporate an exploration of the assumptions of the intervention, and the potential barriers and facilitators around its use within the clinical decision-making process in consultation with the sick child.

I made efforts to retain a fluid and open interview process which provided opportunity for exploration of these concepts, while allowing other ideas that may not be captured within Michie’s model to be expressed.

While this causal pathway model helped with topic guide development, I found as I progressed with the research (including attending training on developing complex interventions) that there was room for refining and developing the logic model of intended effects of the intervention, to account more for the mechanisms by which the intervention could impact on outcomes – as appears in the discussion.
4 Chapter 4: Design, method, analysis technique

4.1 Design
This is a qualitative study of semi-structured one-to-one interviews with twenty one clinicians from eight Bristol general practices.

4.2 Participants
Twenty one clinicians (six male; fifteen female) – consisting of seventeen GPs and three nurse practitioners (NPs) – with a range of years of clinical experience from eight of the ten Bristol practices participating in the EEPRIS study were interviewed. GP surgeries represent a range of areas of deprivation (deciles 1 to 9), and clinicians represented a range of clinical experience (one to over thirty years practising). Participating clinicians were asked if they had particular interests (e.g. paediatrics, infection research, surveillance) that were relevant to their participation as well as their full or part time working status. Participants represented a range of full and part-time and some had particular interests in the subject, most had no particular special interest, and others reflected the relevance of the topic to them due to the large volume of children they see in practice. Details of participants are presented in Table 1.

4.3 Method
4.3.1 Participant recruitment
This qualitative study is nested within the main feasibility study. GP surgeries were deemed eligible to take part in the study if they were located within ten miles of Bristol City Centre.

The NIHR Clinical Research Network (CRN), West of England initially publicised the feasibility study - including details of the nested qualitative study - to GP surgeries in the Bristol area, through the CRN monthly bulletin and email to practice contacts. Details of practices who expressed an interest in the study were passed on to the study manager (EA) to make contact and provide further details to facilitate surgery recruitment. The original aim was to recruit twelve practices. GP practices were recruited from local Clinical Commissioning Groups (CCGs) that provided research governance approval and that the Sponsor (University of Bristol) had approved. The CCGs were Bristol, South Gloucester and North Somerset. Efforts were made to
source different GP surgeries to cover a range of areas of deprivation using the Index of Multiple
### Table 1: participant characteristics

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>IMD decile of practice</th>
<th>Full (FT) or Part Time (PT) working</th>
<th>Number of years practicing</th>
<th>Relevan special interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 (GP)</td>
<td>F</td>
<td>4</td>
<td>PT</td>
<td>10</td>
<td>No</td>
</tr>
<tr>
<td>02 (GP)</td>
<td>F</td>
<td>4</td>
<td>PT</td>
<td>5</td>
<td>No</td>
</tr>
<tr>
<td>03 (GP)</td>
<td>M</td>
<td>5</td>
<td>FT</td>
<td>6</td>
<td>No</td>
</tr>
<tr>
<td>04 (GP)</td>
<td>F</td>
<td>6</td>
<td>PT</td>
<td>17+ (qualified in 1984)</td>
<td>No (relevant as see lots of children)</td>
</tr>
<tr>
<td>05 (GP)</td>
<td>M</td>
<td>3</td>
<td>PT (technically, though sessions a week)</td>
<td>7.5</td>
<td>Yes - Holds a Masters degree in infectious disease</td>
</tr>
<tr>
<td>06 (GP)</td>
<td>F</td>
<td>3</td>
<td>PT (technically, though sessions a week)</td>
<td>7</td>
<td>Yes - Paediatric interest (started training as paediatrician, changed to general practice)</td>
</tr>
<tr>
<td>07 (GP)</td>
<td>F</td>
<td>6</td>
<td>PT</td>
<td>8</td>
<td>No</td>
</tr>
<tr>
<td>08 (GP)</td>
<td>F</td>
<td>8</td>
<td>PT</td>
<td>10</td>
<td>No (relevant as see lots of children)</td>
</tr>
<tr>
<td>09 (GP)</td>
<td>M</td>
<td>3</td>
<td>FT</td>
<td>15 (qualified 20 yrs ago)</td>
<td>No (relevant as see lots of children)</td>
</tr>
<tr>
<td>10 (GP)</td>
<td>F</td>
<td>3</td>
<td>FT</td>
<td>6</td>
<td>No</td>
</tr>
<tr>
<td>11 (GP)</td>
<td>M</td>
<td>1</td>
<td>FT (&quot;debatable&quot;! 7.5 sessions/ week)</td>
<td>10</td>
<td>Commented that the surgery has &gt;2 times national average of under-fives, so large number of children with respiratory tract infections seen.</td>
</tr>
<tr>
<td>12 (GP)</td>
<td>F</td>
<td>1</td>
<td>PT</td>
<td>6</td>
<td>No</td>
</tr>
<tr>
<td>13 (GP)</td>
<td>F</td>
<td>3</td>
<td>PT (5 sessions)</td>
<td>36 as doctor, 32 as GP</td>
<td>ENT lead</td>
</tr>
<tr>
<td>14 (NP)</td>
<td>F</td>
<td>5</td>
<td>FT (9 sessions)</td>
<td>13</td>
<td>No</td>
</tr>
<tr>
<td>15 (GP)</td>
<td>M</td>
<td>5</td>
<td>PT clinicalls - 6 sessions. Further 4 sessions with CCG</td>
<td>30 as doctor, 25 as GP</td>
<td>No</td>
</tr>
<tr>
<td>16 (NP)</td>
<td>F</td>
<td>2</td>
<td>PT</td>
<td>25</td>
<td>Paediatrics/asthma - sees lots of this</td>
</tr>
<tr>
<td>17 (NP)</td>
<td>F</td>
<td>9</td>
<td>PT</td>
<td>27</td>
<td>Generally interested in children. (NB: does not directly prescribe, but makes the decision re ABX prescription which the GP issues)</td>
</tr>
<tr>
<td>18 (GP)</td>
<td>F</td>
<td>5</td>
<td>PT (6 sessions)</td>
<td>28 as doctor, 22 as GP</td>
<td>likes paediatrics</td>
</tr>
<tr>
<td>19 (GP)</td>
<td>F</td>
<td>2</td>
<td>PT (7 sessions)</td>
<td>7 as doctor, weeks as GP</td>
<td>No</td>
</tr>
<tr>
<td>20 (GP)</td>
<td>F</td>
<td>9</td>
<td>PT</td>
<td>8yrs as GP</td>
<td>Several years of paediatric training and attending Resp HIT meetings. Enrolled children in EEPRIS and runs parent education sessions on self care</td>
</tr>
<tr>
<td>21 (GP)</td>
<td>M</td>
<td>2</td>
<td>FT</td>
<td>13 as doctor, as GP</td>
<td>3 No</td>
</tr>
</tbody>
</table>
Deprivation (IMD). NHS service support costs and research costs were offered to GP surgeries for all study-related tasks. Nineteen (out of a possible fifty four) GP surgeries expressed an interest in taking part in the main study. Three were ineligible due to being more than ten miles from Bristol city centre; the four furthest from Bristol were held as reserve in case their participation may be necessary; two did not return their formalised agreement to participate, leaving ten GP surgeries participating in the main study, from which to draw interview participants.

The study design aimed to maximise data collection while minimising clinician time burden. The Research Information Sheet for Practices provided for the main EEPRIS study on gaining an expression of interest from the practice, and before study enrolment, informed practice staff of the interview study. At the point of EEPRIS study enrolment, the main contact (Lead GP, Practice Manager, or other administrative staff) at each of the ten GP surgeries agreeing to participate in the main study was asked to provide details of the practising clinicians (GPs and nurse prescribers) at the surgery, and the best way to contact them to invite to interview.

All the clinicians identified during this process were invited to take part in one thirty minute semi-structured audio-recorded interview each - at a time and place convenient for the clinician. A telephone interview option was offered, though all interviews were conducted face to face. Research costs of £40 per half hour clinician interview were offered as an incentive, in accordance with standard research reimbursement costs, approved by a representative from Avon Primary Care Research Collaborative (APCRC).

There are four GPs in an average-sized surgery, giving an estimated pool of forty GPs to invite plus any nurse prescribers (NPs) and locums working at each practice. By inviting all the clinicians in the ten participating practices, advance estimations were that a sample size of twenty prescribing clinicians to be interviewed (two per practice) could be achieved, with an aim to recruit until data saturation, which was reached in the twenty-one participating clinicians.
4.3.2 Data collection (the interview process)
A participant information sheet specific to the interview study for clinicians (see Appendix 1) was provided in advance of taking part, and written consent was sought directly before the start of each interview (see Appendix 2). The interview began with asking for the demographic details outlined in the description of participants (above). The interview was arranged at a time to suit each clinician to minimise time burden. Data collection took place between the months of February and July 2016.

Interviews were semi-structured, using a topic guide (Appendix 3) to explore clinicians’ current approaches to managing paediatric RTIs, knowledge of circulating infections, and views of a mock-up example of viral and syndromic surveillance information including information on normal symptom duration. The topic guide drew on concepts of the NPT modelling of intervention integration as well as the COM-B model of the pathways, barriers and facilitators to behaviour change (see chapter 3 for further details). The example surveillance information (see Appendix 4) was provided in hard copy within the interviews, with an explanation that such data would be provided online with real-time symptom profiling of circulating RTIs in the community. Two similar versions of the mock-up information were presented, both including a graph of the top three locally circulating viral RTI infections in recent weeks, and symptom clusters for each virus, and one showed a separate list of durations of common symptoms. Clinicians’ perceptions of the value, use, and impact on clinical practice of infection surveillance information were explored alongside preferences for content, design and mode of delivery, with a particular interest in perceptions of barriers and facilitators to effective intervention implementation and impact.

4.4 Analysis technique
The anonymised transcripts from each interview formed the data. Notes of initial impressions were made on reading these data, and possible themes were identified.

Thematic analysis was employed allowing for inductive themes to be identified, with respect to the broader a priori research questions (current clinical context, perceived impact, facilitators and barriers to use, and perceive utility) which formed the broad structure of the topic guide.
Codes were assigned to the first few transcripts line-by-line to begin to summarise and interpret the data. I discussed my initial codes with research collaborators, and compared in more detail with an independent coder (Dr Lane) for accuracy checking. I refined the codes iteratively, condensing them into broader themes to produce agreed coding to apply to subsequent transcripts. Through the subsequent coding process, modifications were made to the coding as new information emerged. I used QSR NVivo for coding the data to enable the charting of themes by participant. This enabled a summary capturing the meanings in the data. By condensing the data in this way, reflections on the meaningful, pertinent themes as well as connecting or divergent perspectives within and between participants was possible.
5 Chapter 5: Results

Table 2: Summary of main research questions and themes identified

<table>
<thead>
<tr>
<th>Broad category of questions</th>
<th>A priori research question</th>
<th>Themes identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration of current clinical context</td>
<td>General context</td>
<td>Fear, risk and safety (children as a vulnerable group)</td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td>Self-presentation as not over-prescribing</td>
</tr>
<tr>
<td>Diagnostic decision-making</td>
<td>Role of GP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uncertainty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dual system decision-making</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probability – likely to be a virus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cognitive bias evidence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parent factors in management choices: worry, expectations, competence</td>
<td></td>
</tr>
<tr>
<td>Infection surveillance in the current context</td>
<td>Anecdotal or no evidence gathered</td>
<td></td>
</tr>
<tr>
<td>What is needed by clinicians to help with uncertainty</td>
<td></td>
<td>No clear need identified</td>
</tr>
<tr>
<td>Response to intervention materials (as presented)</td>
<td>Perceived impact of the intervention</td>
<td>No impact (all known)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impact unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POSITIVE:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinician confidence in viral diagnosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cognitive bias effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supporting clinician explanation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reducing reconsultation rates</td>
</tr>
<tr>
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5.1 Current Clinical Context

5.1.1 Fear, risk and safety (children as a vulnerable group)

The context of fear and risk aversion in paediatric RTI management was evident throughout the interviews, with clinicians actively talking about the worry they – and parents – feel about sick children, and respiratory illness in particular, and with the sense of worry heightened around younger children.

GP1 I know that’s the thing with children, isn’t it? It’s the respiratory failures that you worry... that’s what really worries you with children. Anything that’s kind of respiratory worries, me, because that’s how children get really, really sick.

GP15 I think, as children get older, the anxiety drops. It’s quite anxiety-provoking. Often, more for parents than for children.

In this context, several clinicians spoke of risk aversion as a driver of both parent and clinician behaviour, with a focus on taking the safest option. Several clinicians expressed fear of missing the sick child, showing that anticipated regret (cf cognitive bias) looms large. The fear expressed by clinicians was both around their responsibility regarding the potential deterioration of a child’s health, and in terms of litigation in any ‘missed’ cases. Most clinicians (as we will see) actively spoke of not prescribing antibiotics to children unnecessarily and preferring to see a child for repeat consultation in the context of worry and risk, though some also spoke about defaulting to prescribing for safety in this context.

GP3 I think it’s about doctors feeling scared of missing significant illness and kids getting sick and getting sued.

GP21 do you let the kid go home with the fever etcetera, or do you start antibiotics and go home relax [laughs].

There was some conceptualisation of the primary care environment in this context as adding to the sense of risk, due to having fewer resources (investigative and treatment technology, specialists, emergency teams) than secondary care, and because acute and serious illness management is outside of the norm.

GP6 Yeah, like ... general practice is a slow lane, isn’t it, so we don’t have facility and children go to A&E, they do the blood tests, see if the white cell count’s high; neutrophil count’s high, or they’ll do a chest X-ray – obvious signs, go for antibiotics, and if they’re not, reassure them.
We don’t have that tool here and we have to go on these two ears to listen to the chest and check the pulse rate and respiratory rate [...] So we don’t have that investigation tool with us, so I feel that that’s a difficulty in general practice.

GP7 Yeah I think we see few cases where you’re really worried and have to take urgent action fortunately, but when you do it always gives you sort of sense of nerves because you know, you’re in General Practice. We’ve all done, I’m sure – well I have – certainly done quite a bit of A & E training and Paediatric Training where you see acutely very unwell children regularly but you have all of your backup team there and kind of all the equipment and you’re used to doing that all the time. So you feel slightly more rusty in General Practice because you see a lot of well people and not so very many ill people.

Clinicians also described parents as lacking confidence around home management of minor illnesses in children, and that parents’ worry in this context led to a large number of consultations. More than one clinician reflected that this has become a larger problem over recent years than it used to, with reference to fear-inducing media cases as a contributing problem.

GP5 Cus that’s one of the massive problems that we; I think there’s less, it feels like there’s less self-care and less expertise in the community in terms of when to be worried and when not to be worried.
Int: Less than when?
GP5: A few years ago I think and I think part of that might be to do with maybe the media sort of all the scare stories

GP8 people present with a cold to start with, just I can’t get my head round it, that we’ve got ringing up for urgent appointments for their children, you know, the first day that they’ve had a temperature. It makes us think ‘oh crap, they must be really poorly, we need to get them in and see them’. But ten, twenty years ago, those parents would not have brought their children in, so I feel like they’re...this is just a sign of the fact that...the uncertainty is because people generally don’t know how to manage their own anxiety or have trust in themselves that their kid has got a cold.

5.1.2 Management
5.1.2.1 Self-presentation as not over-prescribing
Most of the participating clinicians described themselves as not keen or quick to prescribe antibiotics to children with RTI symptoms, several talking of themselves in reference to other clinicians who over-prescribe. There was evidence of awareness of AMR (both in prescribing decisions and offering patient explanations), and several clinicians mentioned that most RTIs are viral infections, acknowledging the ineffectiveness of antibiotics as a treatment.
NP16 I think antibiotics are overused (-) and I do think the nurses are much better at making the decision not to use them than some of the GPs

GP4 I think we are all aware that maybe people in the past received antibiotics that maybe wouldn’t have helped, and actually causes problems later on through resistance and so on, or even side-effects to the patients, so we’re aware that most of these things are due to viral illnesses.

GP19 I think in most cases, I think I rarely prescribe antibiotics

GP5 I have relatively high threshold for antibiotic use. Probably higher than some of my more experienced colleagues I would say…. if they are poorly enough to warrant antibiotics, they’re probably poorly enough to go to the hospital for assessment

Most clinicians interviewed spoke of offering patient reassurance around viral illness, and there was a strong emphasis on the importance of safety netting and returning for repeat consultations, educating parents about what risks to look out for. Some clinicians talked in this context of normalising infections, as well as empowering parents to manage them.

GP4 and we say, ‘It looks likely to be a viral illness. These are usually self-resolving with conservative measures.’

GP1 I always do a lot of safety-netting with sick children. I give very clear instructions of what to look out for [...] if they’re getting worse, I’d prefer them to be seen again, rather than just giving antibiotics

GP7 things are very commonly viral and you might more commonly advise, you know, expectant management and symptom relief with paracetamol and fluids and observation, rather than antibiotics [...] you kind of get used to explaining what your findings have been when you’ve examined them, and reassuring that what you see is consistent with a viral infection and explaining that viruses don’t respond to antibiotic treatment but that you would expect for this to get better and you give them an idea of the time frame to look for resolution over and give them advice on how to kind of manage their child’s symptoms and what reasons to represent for urgently or non-urgently. If it’s getting worse or just not getting better over the stated period of time.

GP13 I tend to say, “At the moment, I think it’s this, but things can change. If they’re getting worse, you’re worried, then ring us”

GP21 Well, I just tell them this is a normal part of growing up. Getting recurrent viral infections [... ] Fever is, again fever is a natural thing. A mechanism to defeat the infection. It’s about hammering home the same message all the time, and trying to offload some of the responsibility on to them.
Clinicians were more concerned when their ability to see the child again was reduced (over the weekend, or if the parents may not return), which was recognised by some as increasing the likelihood of prescribing.

**GP21** so you would obviously give a script on a Friday more readily than a Monday. Because you’ve got the ability to monitor them at the beginning of the week

Management options when there was significant concern about the child were to prescribe antibiotics (when necessary), offering a delayed prescription (with some expressing that this was not an approach they tended to use, or was used when repeat consultation was less possible) and referring on to hospital. One clinician spoke of offering emergency treatment within primary care (nebuliser and oxygen).

### 5.1.3 Diagnostic decision-making

#### 5.1.3.1 Role of GP

Clinicians tended to conceptualise their role as to diagnose whether an illness was viral or bacterial, and whether symptoms were serious versus not serious, with a focus on identifying the children requiring intervention (treating with antibiotics or referral to hospital). While some clinicians on questioning if they think along the lines of specific microbiological profiles mentioned that they would consider certain viral illnesses that present as an identifiable syndrome (with bronchiolitis most commonly mentioned in this context), mostly the differential diagnosis of individual viruses was not seen as relevant to the clinician role, with clinicians being largely satisfied with a diagnosis of a virus.

**GP5:** I think upper respiratory tract infections I’m not particularly bothered whether there’s a para influenza or respiratory system virus or what the subtype of virus it is as long as you can kind of just know what the symptomology is going to be then it doesn’t really matter what the underlying cause is unless there is a specific serious complication that you need to know about...

**GP5** ...Yes so its self-limiting illness which, you know, they can manage at home versus serious illness that needs either antibiotics or hospital admission. That’s essentially the GP job [laugh]...

**I:** Yes okay.

**GP5:** Broaching those two for everyone really.
Clinicians talked about their role as treating each child as an individual, independent from the population at large. In this context, they talked about the need to do a full assessment of each child.

**GP1:** I just always assess them as new and they’re all different, and they’ve got different histories and they’ve got different underlying illnesses, and they all just can respond differently, so I think, when it comes to respiratory infections, even if I think, ‘Well, this is ... this could be that,’ I don’t think it would affect my assessment that much.

### 5.1.3.2 Uncertainty

There was a general recognition of the context of uncertainty surrounding diagnostic and management decisions in paediatric RTI management, with some clinicians expressing that it is not always easy to make a decision, while others expressed confidence in working with uncertainty. Many factors were mentioned as increasing the sense of uncertainty, including time limits, lack of definitive means to identify bacterial cases or the children that may suddenly deteriorate, as well as practical difficulties in assessing children, particularly the very young.

**Int:** How confident are you in knowing how to manage?

**GP4:** Yeah, fairly confident. I think we never know for certain and so we always make sure we ... you know, we give clear guidance as to things aren’t improving, then they must come back. And we say, ‘It looks likely to be a viral illness. These are usually self-resolving with conservative measures.’ [...] so we live with a lot of uncertainty all the time – every day, for everything.

**GP3** The smaller the kid, the harder it is to tell, because I think they do get more ill, more quickly, and it’s a bit more veterinary in terms of they’re not telling you so well and they’re harder to examine.

### 5.1.3.3 Dual system decision-making

There was clear evidence throughout the interviews of a dual processing (system one and two) model of diagnostic decision-making with children’s RTIs. Most clinicians interviewed talked about making a clinical judgement based on a gut feeling from looking at the child immediately as they entered the room (system one), and then taking a more deliberate evidence appraisal approach in assessment (system two).

**GP7** So the initial assessment will be conducted as soon as they walk through the door or are carried through the door.
A lot of our clinical assessment is just being with the patient and getting a bit of a gut feeling, and intuition, which you obviously can’t protocolise for that.

So it’s the younger ones that there perhaps might be more uncertainty. What helps you decide in these uncertain cases?

Rely on observations; pulse asymmetry, respiratory rate, pulse, and gut feeling to a degree, how they look, how they sound.

Some clinicians asserted that their default (system one) approach is not to prescribe and assume all paediatric RTIs are viral, while there was acknowledgment from more than one clinician of system one processing as a default to prescribing:

Sometimes, on a busy day, you’re tired towards the end of the surgery. You don’t want to put up with it. Easy option is to give the antibiotic and get it off the child.

The system two processing always involved assessing for specific clinical signs in the child. Commonly mentioned were checking temperature, pulse, respiratory rate, capillary refill time and oxygen saturation as well as checking the presenting symptoms and their history. There was most agreement among clinicians that finding focal chest signs on examination was most significant in diagnosing bacterial infection warranting antibiotic treatment, though two clinicians mentioned an understanding from evidence that chest signs may not necessarily be a reliable clinical indicator. Respiratory distress was a main cause for concern. Many clinicians talked about concerns being raised from systemic signs of illness indicated by abnormal observations but also general signs of unwellness such as not eating, drinking or the child being flat or not very responsive, which seemed to encompass both system one and system two assessment. Many clinicians were concerned about high temperature, particularly if it lasted more than a few days, though some stated that they were not so worried by temperature. Duration and severity of symptoms were mentioned as important factors in several interviews. Different clinicians also cited different clinical signs that would lead them to diagnose as bacterial (high pulse, green phlegm, localised signs such as pus-y tonsils, redness, ear discharge) though these were not consistent across interviews.

if I was going to treat a chest infection, if I suspected a genuine – like a pneumonia – then I’d want to hear focal chest signs when I was examining them to suggest that there was a collection of infection on the lungs
GP5  I think with a lot of doctors it’s still about the chest signs and I know a lot of the paediatricians say you know, chest signs are particularly reliable particularly in younger children and actually there’s more other symptoms that are more prominent in unwell children with pneumonia so they could have no chest signs at all and be just sort of leg pain and be cold and things so non-specifically unwell and actually have pneumonia as the source.

Within descriptions of diagnostic information-gathering (system two), there were several mentions of using guidelines to aid decision-making, though not relying on these altogether. Swabbing was reported as not routinely used, though was mentioned by several clinicians as a means of reassuring patients rather than as a diagnostic assessment tool. Seeking advice from secondary care was also mentioned, though only by one clinician.

The child’s age, comorbidity and history were frequently cited as impacting on decision-making, with younger children and children comorbid with asthma or other respiratory conditions lowering the threshold for repeat consultations or possibly antibiotic treatment due to higher perceived uncertainty, worry and risk. These child factors are likely to involve both processing systems – system one being the emotive, fear-driven aspects of the increased perceived vulnerability of these groups, and system two involving an appraisal of the relative evidence-based clinical risks associated with comorbidity and age.

GP13  I think that the harder group are actually the little ones, because, and I suppose we’re sort of talking about the under-threes, then, because they can – I think there’s a couple of times when we’ve had kids who’ve suddenly ended up being seriously ill with pneumonia.

GP3  kids with other long-term illnesses, so kids with asthma probably get over-treated, I think, because you kind of think, ‘Well, they’ve got asthma; they’re more likely to have bacterial chest infections than anything else,’ and so... and they may get over-treated with steroids alongside that as well.

The gut instinct came out as being particularly important in the decision-making process, seeming to take precedence over detailed clinical assessment or other evidence.

NP14:  I mean; I go a lot on how the child looks.

GP2:  And to a certain extent, just sometimes a general look and a gut feeling, ’cause sometimes you can have someone who just looks poorly, although everything’s fine, and you would worry a bit more about those ones.
5.1.3.4 Probability – likely to be a virus

In terms of Bayesian reasoning and baseline probability (system two), there was no evidence of clinicians appraising epidemiological evidence within their diagnostic decision-making. It was generally expressed that viral infections are most likely, with some approaching diagnosis with an assumption that the presentation was a virus, unless there was a convincing piece of evidence to tell them otherwise.

GP21 The fact of the position is that the majority of, if not all of respiratory infections are viral until proven otherwise

GP13 I think probably tend to assume that they’re going to be viral, mostly, in that age group

5.1.3.5 Cognitive bias evidence

Despite cognitive biases being unconscious processes, interviews elicited some indication of both ‘anchoring and adjustment’ and ‘availability’ biases coming into play within the current context of paediatric RTI decision-making as well as ‘anticipated regret’, with some clinicians being actively aware of some unconscious processes.

The impact of available, salient information on increasing prescribing was directly stated by two clinicians, while many clinicians made reference to salient cases that then impacted on subsequent diagnostic decision-making.

GP3 But there is a risk that you’re not gonna get that right every time, and if you see a thousand kids, you’re gonna find one that actually did have a chest infection, and I probably see a thousand kids, I dunno, a year, maybe, and so I’m gonna get it wrong once a year. And then you’re gonna have a kid that goes to A&E or goes to out-of-hours, and the parents think you’re rubbish and all that kind of stuff, and you go, ‘Well, I’ll just treat an extra ten over-the-top,’ and I think that’s what the limiting factor is.

GP4 with the scarlet fever thing. So I did have a poorly child with a funny rash, just probably just looks like a viral rash, to be honest – didn’t look like a rash that you’d have in yellow [sic] fever, but had really purulent tonsils and stuff, so I thought … And normally I would have given amoxicillin for that, but because of the stuff in the news about scarlet fever, I did give just penicillin by itself, so that did have an impact. Even though I didn’t actually think it was scarlet fever, to be honest,

GP11 if you’ve just seen, if you’ve just seen a case of croup or err you’ve seen a hospital discharge talking about croup, then your antennae for croup is up undoubtedly, so you are then looking out for it
GP15 So, we had whooping cough a couple of years go. Had one of the GPs in the practice with whooping cough [...] but then, because of that, we were much more aware around whooping cough, because of potential contact from that doctor, etc. We traced, actually, all the people he’d seen within the previous fortnight. [...] Probably because it’s in hindsight, no. I mean – I suppose I’ve always got an ear out for when whooping cough is about, in terms of actually, “Do the symptoms fit more with that?” So, I’ve probably got a greater acuity towards the sort of cough you might get in that situation, but probably not hugely.

Anchoring and adjustment was shown mainly in the context of clinicians talking about their current (lack of) infection surveillance information, talking generally of assessing children against others they have seen in practice at the time, or in past experience.

GP9: I guess we’re not getting up to date micro biology advice, but you get a feel of what’s out there, what type of symptoms children are struggling with. So I guess it’s more anecdotal and what you’re seeing or what your colleagues are seeing as well.

I: You say from a triage, so over the phone is that or…?

GP9: Most of it is over the phone. If you’re worried you ask them to come in and see them.

I: So actually it’s about the numbers of cases with similar…?

GP9: Yeah, to a degree. I mean, that’s if symptoms are similar and you have a feeling about within a family if they’ve all had similar symptoms, similar respiratory track symptoms then you kind of veer more towards a viral type infection whereas if there’s only one of them affected then you can suspect that it is possibly less infective but could be something more significant.

Int: Yeah and how do you decide when it’s not quite clear, what do you rely on?

GP11: Uhm experience so uhm how you’ve seen and treated people in the past,

5.1.3.6 Parent factors in management choices: worry, expectations, competence

There was good evidence that clinical decision-making was influenced by parent factors, particularly in uncertain cases. Parent worry was mentioned as a factor that most of the interviewed clinicians would consider, with some explicitly stating that the worry of a parent could push them towards prescribing antibiotics. There was evidence that clinicians evaluated the credibility of the parent’s worry as a contributing factor to management decisions by their perceptions of the parent’s experience with children or understanding of illnesses.

GP2: I guess, some of the other things that would affect whether you prescribe would be, to a certain extent, the worriedness of the parents, because quite often ... although, quite often, they quite ... obviously, they know their children better than you do, so if they’re disproportionately worried, that would sometimes tend to push you towards it [...] and sometimes the kind of home set-up, a little bit. So if... so, obviously, first-time parents worry more, so if it’s a worried first-time mum you would perhaps worry slightly less than a worried fourth-time mum, ‘cause they’d be much more likely to know how they needed to worry”
And so you may end up with kids that you’re very, very confident are self-limiting illnesses, but because of parental anxieties, you may end up treating them differently to how you would if you were just seeing them with other parents.

GP20 I’m sure there’s evidence out there that I’ve read in the BMJ that shows parental worry has a positive, predictive. I don’t know what the figures were, but did correlate with significant illness in children. Like it’s worth listening.

Clinicians talked about pressure to prescribe from parent expectations for antibiotic treatment, and how they struggle with those conversations, talking about having to educate parents, or giving in to pressure by prescribing or offering a delayed prescription. Cultural differences in patient populations were recognised as impacting both on patient expectations for antibiotics and clinicians’ ability to reassure in the absence of prescribing. Interestingly, there was recognition within clinicians’ own experience that it can be their own perspective and that many parents do not actually want antibiotics when it comes down to it, preferring reassurance. Parents bringing a child in for repeat consultations were potentially a part of this perceived pressure to prescribe, and/or perceived as evidence of greater parental worry which could push more towards prescribing.

GP18 And I’m finding it um – there’s a certain cohort of parents that really will struggle to get that message across. And it could be for cultural reasons. [...] they’ve got this perception that the child is not going to get better without antibiotics. Yeah. Okay.

GP18: And it’s often a struggle with them. And then there’s a sort of a compromise. I give them antibiotics but ask them not to start it.

GP3 But sometimes, you project on to the parental anxieties and you sort of say, ‘Well, everyone in the room will be happy so I’ll give you something.’ But actually, those parents are sometimes just as happy if you say, ‘Actually, this is fine; it’s going to be viral.

GP4 I think, maybe if they’d come back again, they’d been sent away... that happens quite a lot. We say, ‘Go away, we think it’s viral. Continue fluids, give paracetamol, try to keep the temperature down.’ And they come back, and you might be more tempted to give antibiotics then.

There was evidence that clinicians’ prescribing decisions were influenced by their perceptions of the parents’ competence to manage the illness or to return if the child deteriorated, sometimes prescribing ‘just in case’ when there was more doubt.

GP11 I’m kind of thinking about parental coping skills, so how well they’re able to cope with their child’s illness and um what experience they have in managing their child when they are ill with a respiratory tract infection, perhaps culturally they’re not used to looking after uh, and there might be additional social factors uh creating a lot of
stress for the family and particularly for the parent uhm that might reduce their ability to monitor their child as well as another family or in comparison to another family.

Int: And do those factors make it more likely that you prescribe antibiotics, is it to sort of be on the safe side?

GP11: Err I think yeah but whether consciously or unconsciously that might come in to it, uhm you know as one of the factors that I mentioned, I think that probably would you know, if I felt I was uncertain about whether this was a virus or a bacteria and one of the things that was making me look and make me feel unsettled is that you know wow you know this child is one of I don’t know ten and mum’s incredibly stressed and busy and there’s also another child in trouble with x, y or z, she might not be able to despite her best intentions or uhm be able to monitor this child as much as she would like ....

Int: Yeah.

GP11: Then that might make me feel, push me more towards prescribing.

Int: And how do you sort of manage those uncertain cases do you think?

GP21: In concert with the parent, you assess whether they’re competent, whether they’re hyper-anxious or you get a gauge on how they are managing things and work out a plan with them. Use delayed antibiotics if possible, if that’s an option or we are always good at bring them back for reviews.

One clinician explicitly stated that where there was uncertainty in prescribing when applying the guidelines, she may let the parents decide:

GP10: (·) So generally in children the only antibiotics I prescribe for those sorts of symptoms would be if they had tonsilitis but I’d just prescribe according to the Centor guidelines, and so if it’s a three out of four then sometimes I use a bit of judgement or let the patient decide or let the parents decide.

5.1.4 Infection surveillance in the current context

5.1.4.1 Anecdotal or no evidence gathered

GPs agreed that surveillance information is not routinely available in primary care, and they had disparate or no means of gathering this information, which, when done was largely passive (e.g. receiving information from parents), reactive (such as checking in response to media reports or patients’ information about infections going round schools/ families) or not gathering this information at all. Some clinicians mentioned sharing information between colleagues at the practice to gain a sense of circulating infections, and there was some mention of PHE reports highlighting particular risks. The planned infection surveillance intervention is novel in this context, and some clinicians expressed a desire for such information.
Int: OK, that’s great. And do your perceptions about what infections are circulating tend to influence your diagnosis or your management?

GP10: I never notice when stuff is circulating. Maybe that’s because I only work two days a week. But I do often use the phrase maybe, “Oh, yeah, there’s bad coughs going around, but they’re all viral,” that sort of thing. But, no, I generally never notice if there’s a bug going round or not. I don’t even notice chicken pox outbreaks. It tends to be off my radar.

Int: OK. So I’m guessing you don’t really have a current practice for finding out what infections are circulating or…?

GP10: No

Int: Sure. So do you have any kind of practice or means of finding out what’s going round at the moment?

GP12: Not particularly beyond if there’s something like Scarlet Fever then you might get an alert from Public Health saying there’s a lot of Scarlet Fever in the area or something with a sort of Public Health significance.

Int: Do you have any other practical ways of finding out perhaps what infections are circulating?

GP5: Hum the parents themselves tell you.

NP17 I wouldn’t know how to access that information currently

Int: and do you have much of a perception about what bus might be circulating in your area?

GP18 no, but I’d like to

In this context, clinicians spoke of a sense that it is a given that there are just lots of viruses going around.

GP12 my perception is there’s just lots of viruses in the winter and that’s just how it is, and maybe it doesn’t make that much difference what the viruses are

5.1.5 What is needed by clinicians to help with uncertainty

5.1.5.1 No clear need identified
Clinicians gave a mixed response when questioned about what is needed to help them make a decision about uncertain cases, with some talking about point-of-care testing as an indicator for antibiotic prescribing, several feeling happy with their own clinical judgement and current resources, and some not really knowing what could be added to help. One mentioned patient information leaflets, and another mentioned increased knowledge of circulating infections, which may have been due to the context of being interviewed about an infection surveillance intervention.

1 Considering the context, it is perhaps surprising that there were not more mentions of infection surveillance in response to this question, which could be a good sign, potentially indicating that
GP2: I know that in adults they’re looking into CRP tests at point-of-care for helping escalate antibiotic prescription - it’s not something that we do here yet, but I’m kind of aware of it as a concept and it’s supposed to be quite good, isn’t it, but I’ve never done it myself. But I could imagine that it might be helpful for adults, and I guess something like that might be helpful.

NP14: I guess it’s not appropriate in children but it was like a little finger pricking and you could work out whether CLP was elevated and then if that was elevated they needed antibiotics, if it wasn’t they didn’t.... It’s not really... you can’t really do that on kids. I don’t really think know if there is anything that will help. I think it is down to sort of clinical judgement because you can have a tool...

Int: And what is needed. What might be helpful for you to help make a decision about that, a grey area sort of child, if you’re not sure? What do you need to help with making that decision?

GP8: I’m trying to think when I had one, we did have some print outs that we could give to patients, adults who are relating to children, that shows what a normal expected duration of a straightforward normal cough or cold would be.

Int: Okay. It does sound like it can be quite difficult to tease it out. Is there anything that you would like or that would help you to make those decisions?

GP9: I’m relatively happy with using the observations. I mean, there’s quite good guidelines from the paediatric in terms of management of respiratory illnesses. I’m not sure what else there could be to help me make that decision between viral or bacterial that might benefit from antibiotics or not.

5.2 Perceived intervention impact

There were mixed perceptions around the potential impact of the intervention in clinical practice, with some positive responses and some less so both across and within interviews. A strong sense came out of clinician interviews that while it was interesting information, it was perceived as unlikely to make much difference to their practice, particularly in the context of the pressures of primary care work. Many talked about sharing the information with parents within the consultation. The three nurse practitioners interviewed tended to express slightly more positive views of the intervention than the GPs on the whole.

5.2.1 No impact (all known)

The main expressions that the intervention was not likely to have an impact involved a sense that the main information – that viruses are prevalent, and have certain symptom profiles – is

clinicians were not showing demand characteristics (aiming to please the interviewer), and were speaking freely.
“all known”, and/or that the differential microbiology does not fit with the clinician role of sifting out the bacterial (or seriously ill child) from the general viruses going around. There was a sense that clinical judgement is of high importance, and there is still a need to do a full assessment of the individual child. The main feature of the ‘no impact’ responses was a sense that it is not going to change the clinicians’ management.

GP4: I’m not sure that would make a huge impact on my management, because I don’t say to them, ‘Oh, I think you’ve got RSV’ or ‘I think you’ve got rhinovirus’.

GP8: I guess for upper respiratory tract infections in kids, just because they’re snotty and they’ve got the symptoms listed here, that they’ve got a fever and they’re achy and they’ve got runny nose, I guess we know already that that’s going to be viral, that’s not a sign of a bacterial infection, so it wouldn’t….having that confirmed with the results, and seeing that there’s a peak at the moment, wouldn’t really change my management I don’t think.

GP13: I mean, to some extent – it’s a bit of, well, ‘so what?’ because none of that is actually going to make any difference to my management. It’s really what they’re like clinically, and particularly with viruses. So, I – I’m not sure how it’s particularly going to help.

GP10: so if any kid with an URTI, 18% at any one time are RSV positive. Would it be good to know that? It’s still not going to change what I do with the individual.

GP3: Yeah, fine – what’re we gonna do with it? What’s it gonna change?

GP19 I probably wouldn’t say, “It’s this,” because I wouldn’t know. So, I’d probably still say, “consistent with a viral illness, an upper respiratory viral illness.” […] and discuss the same management. So, I think it’s interesting, but I don’t know whether it would change practice.

5.2.2 Impact unknown

Some clinicians expressed uncertainty about the impact in practice, or that it would take rolling it out to test the impact.

NP14 I don’t know how much it influences prescribing until I sort of, until it’s done

GP21: I mean I think it’s a good idea, the question is how much information is it going to generate and what we are going to do with that. You will only see by having it I suppose, so yes.

GP2: I think it would be helpful in some cases, I think
Int: Okay, that’s fine. Any particular cases you can think of where this might be helpful?
GP2: I don’t know, really [laughs]

5.2.3 Potential positive impacts

Despite the strong theme outlined above that it was unlikely to have an impact, there were many positive comments about the intervention.
do you have any other comments at all about this type of intervention? [...]  
No. I think it’s a really good idea. A really good idea.

5.2.3.1 Clinician confidence in viral diagnosis

There was a lot of talk about the intervention increasing diagnostic confidence, and reducing uncertainty, which is consistent with the intended effects. There were different foci for these effects, as outlined below.

Some felt that the intervention could help with the diagnostic and assessment process, with some responses indicating that there may be an impact via a probability assessment (i.e. aiding a Bayesian reasoning approach to diagnosis).

It improves your diagnostic skills, really, which is good, and it’s something that we don’t really currently have a lot of access to.

so I can see just reading this top bit about knowing what the local bugs are may help reduce uncertainty about the cause. [...] The number of cases of this is going up so yeah, kind of makes it more likely that it’s viral, so you don’t need antibiotics. Can see how that would be helpful.

It kind – it might help you reach a diagnosis ‘cos it’s often making a diagnosis about piecing separate bits of information together and there’s almost – it’s not that commonly in General Practice that you see things that are an absolute dead cert diagnosis. You sort of just saying “Well it’s probably this”.

One GP commented that it could help with history-taking in the assessment, particularly with patients who don’t have English as the first language, for example “if croup was very prevalent you could then use the interpreter to try and ask more specific questions” (GP11).

Some felt that it would be good to improve knowledge of viral illnesses as a whole by educating clinicians over time, particularly regarding symptoms duration.

I like this, and I suppose, kind of, the common symptoms and stuff, if you looked at it every week, you’d get very used to them, and we sort of know them anyway, really, but if the kind of patterns are changing week-on-week, then it’s probably quite nice to be reminded and it doesn’t necessarily take very long to look at it, and the symptom duration’s quite useful, I think, ‘cause sometimes you do forget.

This is obviously useful.

Yes, the symptom duration yes. And do you find that parents know that or they are surprised by that?

I don’t think that they are aware...I don’t think doctors are aware of it so [laughs].

Do you think there are some GPs that would perhaps benefit more from this information and a bit more of a reminder about what could be going around the local area.

Yes, I suppose that would be a useful way of getting it in, you know cementing it in their minds.
Interestingly GP21 was conceptualising this as being helpful for other clinicians, though not for himself, which is consistent with the sense identified that clinicians perceived others’ prescribing as problematic but not their own.

A theme came through from many clinicians that the intervention would increase their confidence by supporting their decision-making after they had made the decision (post-hoc), i.e. boosting their sense of the accuracy of the viral diagnosis they had already made, which was mainly reflected in the context of patient explanation (as outlined further below).

Int: would that impact on how you actually went about your day-to-day practice with children?
GP6: Yeah, just to relay that information with more reassurance, saying that, ‘Yes, this is what ... the likely cause of the symptoms.’ Being more sure about that and relaying that information to parents

This reflects the sense that most of the clinicians perceived themselves as not tending to overprescribe antibiotics, and that perhaps no change to their diagnostic or management decision-making was required.

5.2.3.2 Cognitive bias effects

Additionally there was some mention of the intervention having a cognitive biasing effect to potentially increase viral diagnosis, particularly in terms of availability and salience (despite this being an unconscious process), though these came out more as concerns about the intervention contributing to missing a sick child (see exploration of this concern further below).

GP7: I mean doctors are just normal people as well and we’ve – our brains work in the same way as a lot of other peoples. If you shove something in our face repeatedly we’re going to think about that a lot more than all the other less likely causes [...]  
Int: Yes  
GP7: Sometimes we can be suggestable as well

5.2.3.3 Supporting clinician explanation

Many clinicians spoke about the impact of the intervention in aiding their patient explanations. This was largely seen as a resource of information to share with parents to enhance communication, though notably it was often conceptualised as of use in this way once the clinician had made their diagnostic and management decision.

GP9: If there was there’s this virus going around, I suppose it could help you back up your reassurance
to parents

GP10 But then it would be helpful then to know if the patient... if I do decide then it is a bug, and I know that there is one going around, that would be really helpful to be able to say that

A theme emerged from several clinicians of the intervention adding credibility to clinicians’ explanation through backing it up with up-to-date science, enhancing the ability to offer reassurance in this context, and for patients to trust what the doctor is saying:

GP2 sometimes it's quite useful to have something you can just show to people and say, ‘Look, it’s written here, and experts ... in black-and-white, and this is what they’re saying, and I’m not just making it up to get you out of the room!’ [Laughs].

It was seen in this context as providing an “added layer of information that you can pass on to the parents to keep them informed” (GP9), giving greater detail and potentially enhancing patient satisfaction and trust in the clinician. There was a sense that patients can feel cheated by generic explanations of ‘it’s just a virus’, and this could address that issue:

GP20 as a clinician, nice to be able to offer something [...] I think maybe some parents feel fobbed off by their GPs saying ‘It’s just a virus, why are you coming here?’(laugh)

GP5 I think sometimes more so parents want a label, like not just be given; I think when they say the doctors just told me it’s a virus they feel fobbed off. Like they don’t feel like you’ve given them a proper diagnosis so if you say this is a, in a way if you name it a bit better, it might actually improve their trust in what you say and trusting in terms of duration and trusting in terms of the management of complications

Clinicians also talked about the potential role for the intervention in aiding expectation management, advice and parent education, particularly with the provision of information about the presenting symptoms and their duration; and helping with safety netting.

GP19: by showing the symptoms that we expect, it can help with safety netting, and help with discussing what we’re more worried about

GP5 number of days to resolution. See that is useful. That would be very useful

Int That’s the symptom duration?

GP5 Yes because you see children, depending on the parents, you see children two or three times in one episode of illness and I just think the level of demand and the ability to cope with that if you can say this is, you know with definite, this is the resolution time then it does help to try and educate the parents towards that really.

GP6 Duration is quite useful, so then I can manage patients’ expectations accordingly – yes, it’s
gonna last for two weeks, tree days, five days, whatever – and then they know that they have to wait for that long before the symptoms completely resolve or subside

More than one clinician spoke of using it to aid an empathic communication approach with patients, sympathising about nasty symptoms going round. One clinician gave a great example of a reassurance script that could be given based on an understanding of the intervention material, which nicely encapsulates the sense of adding credibility and aiding empathetic communication as well as showing a good sense of the probabilistic reasoning aspect of the intervention:

GP7 often it’s helpful to show something tangible like a graph or a picture and that sort of validates what they’re telling you, and what you’re telling them; in a real thing and you’re confirming and saying “Yes, and in fact we know that at the moment from our infectious diseases surveillance team, that this is really common and they’ll be a lot of people suffering with similar symptoms, so the chances of catching it at the moment are high, and the chances that it’s anything else seem, you know, probably are reduced by the fact that this is very likely. It puts other more serious causes less likely than this one. Your findings are all consistent with this and look, here are your symptoms. They sound exactly the same and if that’s what this is, then you know, the chances are that it will get better in this time frame.”

5.2.3.4 Reducing reconsultation rates

When talking about supporting patient explanation, clinicians recognised potential for reducing reconsultation rates – with one GP commenting on this from the aspect of enhancing credibility in the clinician’s diagnosis:

GP12 some parents are just happy to be reassured that their child’s going to recover and it will resolve but there’s some where they probably go about feeling a bit cheated so it might possibly help with kind of rates of re-presentation.

Other recognised potential for reducing reconsultation from the expectation management aspects of the intervention, through educating and empowering parents to manage the illness at home:

GP4: Well, hopefully, it’s that discussion with the mum about expectations as to how long the illness would last, so if they’re expecting it to be ... it won’t be bad for three weeks, but if it’s going to be three weeks until you’re back to normal, as long as the child’s not deteriorating or taking a turn ... or anything else happening to them, then hopefully, they will feel able to manage them at home better and not bring them up to the surgery all the time, I think.

5.2.3.5 Reducing antibiotic prescribing

There was some talk of the intervention increasing clinicians’ confidence in not prescribing
antibiotics, again consistent with the intended effects. This was particularly the case for the nurse practitioners:

**NP17** I don’t think it would necessarily change that bit [advice given to parents], but I think it would give you more confidence not to give them the antibiotics.

**NP14** so if I knew that they were circulating I’d be like, ‘oh, okay, they’re more viral,’ and so possibly less likely to need treating.

**Int:** Are there any other comments that you have that you think would be helpful?

**GP15:** I don’t think so, and I think this can certainly contribute to the lower use of antibiotics, and provide a feedback for, or a tool to use with parents.

**GP11:** you could be more confident at saying that it’s a virus and it’s not bacteria and antibiotics aren’t needed

**GP1** if you then saw a child who quite likely fit into one of those categories, then you might be less likely to prescribe antibiotics if you were going to, if everything else was okay and there wasn’t any other worrying features

There was also evidence of using the information in the face of patient demand for antibiotics, to offer as an alternative to prescribing, or to aid the ‘difficult discussion’.

### 5.2.3.6 Other potential (positive) effects

Other potential positive impacts of the intervention that clinicians identified were contributing to an ability to plan – particularly around resources for appointment provision by knowing when there would likely be an increase in demand for appointments.

**GP9** that would be useful [...] almost for preparing. Well, actually do we need to get extra doctors in? How prevalent is it? How virulent is it? Do we need to be thinking about resource planning rather than on an individual level?

There was some mention of the possibilities for new research knowledge that surveillance information could contribute via retrospective analysis of the data, which could have an impact on general practice:

**GP3** If you could find a positive finding that was sensitive and specific for not needing treatment, so a snotty child with a crusty nose being 99.9% certain that that was a viral infection, as proven by the swabs on all the snotty kids, then that would probably change GP practice.
One clinician (GP15) saw potential for the intervention in helping nurse practitioners (who in that surgery had a primary role in managing minor illnesses) to identify the children who needed to be seen by a GP.

5.2.4 Potential negative consequences and concerns:

5.2.4.1 Missing the sick child

Clinicians’ main expressed concern about the intervention was that they would need to be wary of it contributing to missing a sick child, largely by acting through a confirmation bias, giving the clinician false reassurance, and/or reducing the clinician’s impetus to make a full clinical assessment of each child as an individual. There was a sense of worry and mistrust of the intervention in this context, and this highlighted the (previously identified) theme of fear, risk management and children as vulnerable.

This wariness is an interesting finding, particularly in the context of clinicians’ current approach of assuming there are lots of viruses going around, that their knowledge of circulating infections was largely anecdotally informed and that they often took an experiential approach to diagnosis. It seems that clinicians were not on the whole perceiving the intervention in terms of enhancing diagnostic accuracy through the evaluation of up-to-date epidemiological information in an assessment of pre-test probability. Perceiving this as a concern, rather than a benefit poses a direct contrast to the recommendations for clinicians explored in the introduction. 48 51

GP10: it’s a bit dangerous to start putting stuff down to some other thing that’s going round. It’s important to still consider all the… say a child was vomiting and I know there’s a vomiting bug going around, actually they still could have a urine infection and knowing that there’s one going round isn’t going to stop… shouldn’t cloud my judgement as to whether actually they still could have a urine infection. So probably I try and ignore data like that [...] Yes, I’d still be worried that I wouldn’t want to use group data to cloud what the individual was coming in with.

GP2: I suppose, the risk with that is that you might possibly be falsely reassured occasionally, but I guess you just sort of have to look out for that, don’t you, and do your safety-netting and that sort of stuff.

Int: Mm, tell me more about that, then. So if you had information on what’s going round at the moment, it sounds like that might be helpful, but comes with a risk? Is that ...?
GP2: I think it probably would be helpful, but I think ... I guess, in theory, if you were busy and rushed off your feet and you knew there was lots of a particular virus infection going round, you might be more likely to put it down to that and do a briefer assessment than you should do, but I think you just have to be aware of the importance of not doing that and making a full assessment.

GP1: I think it definitely could be helpful, but it could also make you jump to that conclusion rather than fully assessing something, which would make ... you don’t want to miss something else by just ignoring ... that it’s gonna be that because that’s what’s going around. You have to be a little bit careful.

5.2.4.2 Adding complexity

Other potential unintended consequences of the intervention were identified by clinicians, including adding to information overload and increasing complexity (which could add to parent anxiety) and potentially increasing treatment if treatable illnesses were identified. These were not consistently mentioned across interviews, but worthy of consideration in intervention development nonetheless.

GP8: there’s just a risk of overloading people with information that’ not actually going to make a difference in consultation

Int: Yeah.

GP8: I don’t think we want to know any real nitty gritty details about what coughs and colds are going round, because if it’s a self-limiting illness anyway, taking on that little bit of information it’s just too much.

GP13: but if you make things too complicated, and generate anxiety, because what, to be honest, what does it matter which one they’ve got?

5.2.4.3 Accuracy and representativeness of content

Three clinicians expressed concerns about the accuracy of the intervention content, one questioning whether the information would be representative of the full patient population:

GP3: you’re not necessarily gonna get a representative population. The nice people, that are sort of, ‘Oh, yes, I want to help, and wouldn’t it be interesting?’ will do, but you don’t know whether they’re actually the kids that are getting the same bugs as... Is it representative of the entire population? How do you manage to get the cohorts... the difficult-to-reach people, and the difficult-to-reach people are the people that come up a lot and get ill

One clinician questioned whether the numbers would be statistically significant “to actually be able to say, ‘This actually, is what the problem is in your locality’” (GP15), and one clinician reported being “slightly sceptical” about the presented differential profiles of symptoms per virus:
GP11: knowing how [...] being able to pick them out differently, you know runny nose and runny nose and cough and cough and reduced appetite. I can’t believe that influenza doesn’t cause reduced appetite in a child, but it’s not down there and fever and fever, so the only, the only unique one to RSV is wheezing, but does that mean it never happens with influenza A?

Although these are individual responses again, they are important considerations for the design and content of the intervention, which need to make every effort to be as accurate and representative of the population as possible.

5.3 What do clinicians want from the intervention: Facilitators

5.3.1 Content

Clinicians were mostly positive about the visual presentation and amount of information they were shown within the mock-up intervention example: this being a graph showing the top three most prevalent viruses over recent weeks, and a list of associated symptom clusters and typical symptom durations. There were no consistent preferences for different presentation style or amount (only a few minor personal preferences for changes were elicited).

5.3.1.1 Symptom duration

The majority of the clinicians commented that symptoms duration was particularly useful information, and even those who were less positive about the intervention overall were interested in the symptoms duration in particular. There was a sense that both clinicians and parents needed to be reminded that symptoms often take longer than expected.

GP12: I’m willing to be educated on it, but I can’t...I can’t see...the symptoms durations data there is actually is incredibly helpful, I’d like to keep that, that’s really helpful because I think maybe our perceptions and also parents’ perception is that it should be a lot shorter than that and so that’s really helpful to be able to say ‘ok, 90% of children a common cold takes 15 days’ [...] but from my point of view, viruses are always going round, these are viral symptoms so I’m not sure it actually makes that much difference.

5.3.1.2 What to change, risks to look out for

The main theme in terms of what clinicians reported as wanting from the intervention was change, in all senses – what new risks to look out for, what unusual symptoms may be presenting as part of a virus pattern, and what they need to do differently. Information on the regular circulating minor viruses was seen by many clinicians as of limited interest in the
context of their role as assessing for risk. A desire for management or safety netting information was expressed, so that the intervention would incorporate what to be concerned about as well as what not to be.

**GP9**  
I think it would be useful to know if, for example, the RSV was leading to more admissions and children were more unwell with the RSVs compared to influenza or the Rhinovirus. I think knowing what possible impact or a better idea of what’s causing it would be useful other than “Oh well, we think this is an RSV rather than influenza A or a Rhinovirus.” If you said, “Well actually that one’s much more risk of being admitted or deteriorating and you should be more cautious of that,” then I suppose that could heighten your awareness of if you get these symptoms they need to be more aware of the risk or look more carefully at the child possibly.

**GP11**  
I can’t imagine using this unless it had more patient uhm management features to it, you know how to look after your child with influenza A symptoms, uhm but I guess that’s a slightly bigger, bit of work.

**GP8**  
I’d want to know something that would make an impact on the advice that you’re giving parents and also for us to not be so reassured when we eyeball a child that it... ‘oh no, this is just more of a common cold’ [...]  
...if there are ones that are a bit out of the blue and worrying, even if there are fewer cases of them, if they’re potentially going to have more of a devastating impact on children, you’ve got a bit of a heads up about that.

Interestingly, this approach rests on the assumption that the status quo of paediatric RTI management is fine, and change is only needed in relation to shifting risks or unusual events in the environment, rather than in aiming to shift current clinical practice.

### 5.3.2 Delivery:

#### 5.3.2.1 Accessibility

The main feature wanted from an intervention of this kind was for it to be accessible. Clinicians expressed a need for the information to be delivered in the easiest way possible, being both easy to access and easy to digest, such as succinct information within the body of an email (not as an attachment), or as an automatic headline message delivered within the EMIS system (electronic medical database used within Bristol GP practices), and with a web page link from these prompts that clinicians could access with one click. Some clinicians reported that it may get lost amongst all the email traffic they receive, while others felt email was the best mode of dissemination. One NP commented that if coming as an email, it would be seen as important compared to others:

**NP16:** on a website would be quite good because I mean, you could just have it on your desktop and just click into it and just see what it’s about.

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**EMIS Web details can be found online:** https://www.emishealth.com/products/emis-web/
Int: Yeah. Are there any ways of this information coming to you that you’d be quite reluctant to have, for example, if you’ve got a heavy sort of burden of work or paperwork or emails or something along those lines that you think would be unhelpful to have extra bombardment?

NP16: Yeah. Not really. I mean, I do get bombarded with emails but I tend to sift out pretty quickly what would... and I would class that as being quite important.

Clinicians particularly did not want to have to log in with a username and password, or have to hunt for the information. A few clinicians mentioned having the information within an app, but this was not unanimous, and there were references to several different online resources that clinicians use within clinic, showing that use of an online resource was consistent with existing practice. There were mixed responses as to receiving the information (clinician in passive role), or actively seeking it out, with some wanting aspects of both – for example, a regular prompt with a link to then check.

There were also mixed responses to best frequency or timing of intervention presentation, though many agreed that weekly would be appropriate. Some wanted to access the information themselves, possibly on a daily basis, while others only wanted to receive information if and when there was a significant change to be aware of (linking with the change theme outlined above), and there was a sense of the intervention having a changing relevance for regular use based on the season, with winter being more necessary.

GP10 I’d probably use it most days. If I could access it with one click

NP14 I think probably once a week, I think, is reasonable

GP18 Yeah, and I probably will be sitting looking at it weekly in September, October and November

GP5 in the winter and things you probably want more frequent you know weekly updates for example but in the summer you don’t really

GP1 an e-mail alert of how things have changed, I think that would be useful

5.3.2.2 Recipient – clinician, nurse or practice manager

While many clinicians were receptive to receiving the intervention and/or directly accessing it themselves, some of the GPs expressed a preference for the intervention to be delivered to another member of practice staff such as the practice manager, or an infection lead, to then be disseminated to the clinicians. This was described as either at the clinicians’ preference, or when it was significant for them to know.
GP20 I think send it to the Practice Managers and ask them to have a discussion about how people would like to receive it, or, the Practice Managers forward things on that they think we would like to receive.

GP3 I think someone should have this information, but it’s not me on a day-to-day basis, and someone should be feeding me when there’s big and important changes about that, but infrequently and with a tangible change in my practice as a result of it – so something meaningful that’s gonna be different off the back of it.

One GP suggested that nurse practitioners would be better targets for the intervention, due to their prominent role in minor infection management at that practice, conceptualising the nurses as more methodical and having more capacity to attend to the information that GPs. Nurse practitioners themselves tended to be positive about using it themselves, with one NP commenting that “I think, you know, an experienced GP with years of seeing every winter, or whatever, is probably going to pooh-pooh it a little bit” (NP17).

GP15 I think most GPs would see it as being, if it came round by email or whatever, “That again,” and just never quite get to it because of the volume of all the other bits going on. So, I think having it there as something which could be accessed. But I think here, probably, the nurses would use it much more […] because nurses tend to be much more methodical in terms of what they’re doing…

5.3.2.3 Shared use with patients in the consultation
Most of the clinicians expressed that they would be likely to share the intervention with patients within the consultation, which came out particularly when discussing the impact of the information in aiding communication (as outlined above).

GP10: If there was a website and it just flashed up with something obvious that I could show the parents

GP19 if it’s linked to EMIS, then I’d probably use it in the consultation

GP6: If you’re so confident in yourself that you don’t feel you need any information, then you’d go ahead with that, but if you’re in doubt it seems to help […] If you’ve come across a patient with a problem and you’re not sure, so then you’d be able to say, ‘Okay, yeah, these viruses are more prevalent and there are some things …’ Yeah.

Before the interviewer brought up the idea of the separate parent-facing information, some clinicians actively talked about the intervention as a good resource for parents to use outside of the consultation – one talked of offering it to parents within the consultation as a resource to look at afterwards, some suggested the intervention would be valuable as a resource for
parents in the community, or as messages for patients in the waiting room. One GP, by contrast, felt that the information would be better only going to the GP (not parents).

There was strong sense that the information would be useful for some parents and not others, indicating that there would be patients with higher levels of interest in knowing more compared to those who are satisfied with general reassurance.

NP14 I may share it with parents; it sort of depends on their... not level of understanding but sort of how engaging and stuff they are

5.4 Barriers: Information overload, lack of time, lack of fit with clinician role

Three main barriers to uptake were articulated across interviews: Information overload, lack of time and lack of fit with perceived role of the clinician. Lack of time and information overload were predictable aspects of the clinical context, and these were well represented within interviews.

Int: how do you feel about using technology of this kind in a consultation?
GP2 generally positive, apart from time pressures
GP9 you've got so much coming through it's almost information overload.

Lack of fit with perceived role of clinician is more complex. As we have seen, there was a perception that the clinicians’ role is to identify the bacterial or serious infection from the general ‘lots of viruses going around’, and surveillance information that presented the microbiology and syndromic profile of common viruses did not fit with this model. Interestingly, there was evidence that clinicians perceived a dichotomy between theirs and the parents’ agenda, with clinicians feeling satisfied with a general viral diagnosis, but recognising that parents may want more than this.

GP5 cus if it doesn’t change what you do then we don’t need to know in a way
GP12 For some parents, maybe not... for some parents maybe it would help them if we could be a bit more specific than saying erm, it’s a virus because often parents are very unsatisfied with us saying it’s a virus, for us that’s a kind of satisfactory explanation because it’s something that doesn’t need medical intervention...
In the context of risk management and fear of missing the sick child, an intervention aiming to allay concerns by showing what not to worry about was not a close fit, as we saw with GP8 directly expressing a desire for the intervention not to reassure that it’s a common cold. Add to this that clinicians expressed a perception that aggregate data is not relevant to their role as making a full assessment of the individual child, and the potential mismatch of the intervention with the clinicians’ perceptions of their role is an important one to consider.

5.5 Perceived utility – will the clinician use it (implementation)?

There was a mixture of responses to whether the clinicians felt they would use the intervention – both across and within interviews, i.e. some clinicians expressed doubt about the use of the intervention while expressing their intentions to use it regularly – within the same interview (see GP11 quotation below). Several clinicians felt the information was useful, while some felt that, while it could be interesting, it did not have enough relevance to be useful in practice (as outlined above).

*Int:* And how likely do you think you would be to use that material?
*GP10:* I’d probably use it most days.

*Int:* But just thinking of it as a sort of overall, if it was available, and you did happen to look at it, how would you like to look at it? How would you like to be able to access something like this?
*GP13:* I don’t want to.

*GP15:* Sorry, I don’t think GPs would routinely check it.

*GP11* so how is that information helpful to me, it might be in the future when we have specific antiviral therapy I don’t know, but my concern is that I would just ignore this

[later in same interview:]

*Int:* and how likely do you think you would be to use a resource like this?
*GP11* uhm I would like to think that I would check it weekly

*GP19* I think if I was prompted, I would always look at it [...] If it was delivered in a good way, that was easy for me to do, and not take up too much time, then I would be likely to use it. Yes.
5.5.1 In an ideal world

There was a sense that the intervention, like many things, would be used in an ‘ideal world’, with the intervention conceptualised as a nice extra but not an essential in the context of the pressures of the primary care context.

R: Do you think you would use this in a consultation with a parent and a child?
GP2: I think, yes, I think I probably would. It would depend a little bit on how busy things are, ’cause there’s lots of things that are kind of ideal to do, like give out the patient information leaflets and that sort of stuff, and actually, when you’re under pressure, sometimes what you do is the minimum you need to do to be safe. But yeah, I think, in an ideal situation, it is something I probably would use.

GP20 Yeah, I suppose it would help but it’s not needed, it’s like the cherry on the cake (laughs).

5.6 Overview

If an overview of GP responses to the intervention could be encapsulated in one quotation, it would be the following from GP7, which shows a range of both positive and negative reactions within the same response, and includes all of the following themes: A desire for the content to focus on change and risk, probabilistic (Bayesian) reasoning, a sense that the intervention is not likely to impact on management, the role of the GP as assessing a child as an individual based on their clinical presentation, the use of the intervention in educating parents, (content presenting change information leading to) improved diagnostic decision-making and usefulness, and that the intervention is also unprecedented in the clinical context:

INT: if you had information on locally circulating infections, respiratory viruses in your area, would it help do you think in practice?

GP7: I think if there was a particularly virulent strain that caused – I suppose it would be useful to know things like if there was loads of RSV around, ’cos young babies and infants get bronchiolitis often from RSV; and if the levels were peaking in the community then you kind of almost might expect to say “alright, well when I’m seeing this child who’s a bit wheezy and a bit off colour, it’s probably bronchiolitis it’s probably an RSV infection.” Again it probably wouldn’t alter my management because I would only treat them as it seemed appropriate from the way they looked in front of me and from what was happening with them in terms of feeding and kind of you know, the physical functions, but it would be interesting and it might help me in educating the families better I suppose. And if there was a virus that was causing lots of very prolonged cough symptoms or caused some particular type of rash or vomiting or diarrhoea or something like that as part of its symptom pattern then it would be interesting and it might help me make better decisions about what could be causing symptom patterns I suppose. So I mentioned it because there’s never been anything like that.
5.7 Additional exploration: Clinician perceptions of a separate parent-facing intervention

GPs had mixed responses when asked about plans for the separate parent-facing intervention, with interviews eliciting both positive responses and concerns. The main concern was for increasing parent anxiety and demand for healthcare services. While some felt there was potential for reducing unnecessary consultations, concerns were also expressed around the intervention causing some parents not to bring in their sick child when they should.

In this context, clinicians spoke of three main design needs of the parent-facing intervention: to be accessible (practically and to be clearly understandable), to use lay language (to avoid raising anxieties) and to offer clear safety netting (to reduce risks of missing the sick child).

Other potential effects identified were in helping to educate parents about viruses and home management and reducing demand for antibiotics. There was evidence that clinicians may not trust this intervention from the point of view of it being difficult for parents to make judgements without seeing an expert; it may contribute to inequality as it is likely that both participating in surveillance and utilising the intervention may appeal much more to higher educated populations.

5.8 Dichotomising parent/patient populations

Many clinicians tended to dichotomise patient populations into those who were ‘sensible’ (GP3) or ‘interested and knowledgeable’ (GP4) or with a ‘higher level of educational attainment and more anxious’ (GP5), ‘on the ball, quite middle-class’ (GP10) ‘well-educated’ (GP20) for whom the information would be something they would engage with – both if shared within the consultation or as a community resource. This compared with a patient population for whom it may not be appropriate or interesting to share the information: ‘some people won’t read it, some can’t be bothered, some people can’t read’ (NP14); English not being a first language was also seen as a barrier for parents’ understanding of the intervention (GP12).
6 Chapter 6: Discussion

The results meet the key research objectives in the following ways:

1. **The perceived utility of the intervention**

   As we have seen, there was potential for the intervention to be used by clinicians, with many comments outlining clinician intentions to access the information and make use of it, or recognising it as interesting. The fit with the context of current clinical practice was a limiting factor, however, most notably in the mismatch with the clinicians’ perceptions of their role in making a clinical assessment of the child as an individual, and in their focus on looking for risks, as well as a perception that their main approach to RTI management did not need to change.

2. **Clinician preferences for design, content and mode of delivery, identifying barriers and facilitators**

   Clinician preferences were elicited, with most finding the amount and presentation of the information acceptable. There was a strong need for the information to be accessible and quick and easy to take in, particularly in the context of the identified (and expected) barriers of information overload and lack of time, with passive receipt via EMIS headline or brief summary email with a link to click for more information being potential options, or a website just one click away for clinicians to access. The main barrier was the lack of fit with the role of the clinician in assessing for risk, and in using clinical expertise to attend to the child as an individual. The main perceived elements of the intervention that would facilitate its use were symptoms duration (which was almost unanimously recognised as highly useful), and a need for the information to focus on risk and change – presenting what is different, or what clinicians need to worry about, rather than what is not to worry about, and is not changing a great deal.

3. **Perceptions of the potential impact in practice, with an interest in testing the hypothesis of the intervention impacting on diagnostic confidence, and enhancing patient explanation, while also inviting perceptions of unintended consequences**

   There was evidence that clinicians identified all the intended effects of the intervention, with many talking about increased diagnostic confidence, and enhancing patient explanation as well
as some allusion to cognitive bias effects. A more nuanced exploration of the means of these mechanisms was elicited, in particular that clinicians talked about using the intervention to back up a decision they had already made, increasing their diagnostic confidence post-hoc, as well as some talking about using it in aiding assessment. This was an interesting finding in that it showed the confidence of clinicians in their decision-making, and reinforced the sense that their current approach did not need to change. There was evidence also of a more nuanced understanding of potential mechanisms by which the intervention could aid patient explanation and contribute to the desired outcomes of reduced antibiotic prescribing and increased advice for home management, for example by adding credibility to the clinician’s advice, aiding in expectation management and safety netting, and having a role in helping with difficult discussions with antibiotic-seeking patients. Other potential positive effects were also identified, with the main one being that it could help in resource planning when a known upsurge in consultations was likely.

The main unintended consequence was a fear that the intervention could contribute to missing the sick child, which is a key finding that needs to be considered carefully in the development of the intervention as well as how the material is presented to clinicians in future.

No large differences were evident between the perceptions of GPs and NPs interviewed, though the limited number of NPs interviewed were slightly more positive about intentions to use the intervention, perhaps due to the fact that they tend to have more time with patients than do GPs. It is to be noted that Nurse Practitioners have a different training and experiences from GPs, with the key notable differences being that (i) they do not hold ultimate responsibility for all patients like the doctor does, (ii) they tend to deal with the more routine or less complicated cases, referring complex patients to the doctor and (iii) they have more time in a consultation, typically twice as long with a patient as a GP might. These are important distinctions between the clinicians within this study, and it is a limitation that only three NPs took part. It is possible that data saturation was not reached in our subsample of this professional group, and that including more NPs could have provided stronger evidence of differing attitudes between GPs and NPs.

Interestingly, GPs tended to assert that they did not prescribe too much, and only when necessary, thought they also described several non-clinical factors (e.g. parent worry,
competence) that can push them towards prescribing, as well as using different clinical signs to recommend antibiotic treatment.

6.1 Intervention development

The intervention content needs to be as accurate and representative of the population as possible. It will be well received if it has useful information on the expected duration of symptoms, and would potentially benefit in terms of clinicians’ perceptions of its use by including risk management or safety netting information. The intervention needs to be highly accessible and easy and quick to digest.

The issue of clinicians’ desire for information when there is a change that increases risk to look out for is an important one to consider for intervention development. This is in fact rather opposed to the intention of the intervention. Perhaps the inclusion of risk-related information and safety netting elements may be enough to allay these concerns, perhaps there is work to do around educating clinicians about Bayesian reasoning and epidemiological assessment, or perhaps the intervention could be presented in a way that matches this perceived need without being radically different, through wording and presentation. This will form a key part of the intervention development and associated PPI consultation.

For many of the intended effects of the intervention – both in contributing to diagnostic assessment, and having an effect via unconscious or system one processing, it may be beneficial for it to be presented regularly, rather than clinicians only being able to actively access it. This is particularly in the context of limited time, clinician perceptions that it will only be useful if the information changes significantly, and with the sense that clinicians may otherwise only use it to back up their decision-making post-hoc. However, it is important that the information is presented in a way that does not contribute to the clinician workload, and is not easy to dismiss without reading.

Several clinicians expressed a desire to be able to actively access it themselves, and there was a strong sense of sharing the information with patients within the clinic. This means it is important that the intervention be accessible in response to clinician demand as well.
6.2 Logic modelling of potential mechanisms of intervention effects

The potential mechanisms by which the intervention may impact on desired behavioural outcomes can be mapped into a logic model, or causal pathway. See figure 3 for a diagrammatic representation of the causal pathway of potential effects of the intervention, including both intervention and implementation considerations, in accordance with recommendations. This model incorporates the key mechanisms by which the intervention could have an impact, as outlined in the introduction: Bayesian reasoning and cognitive biases as impacting via the two thinking systems in the diagnostic process, and key elements of the COM-B model of behaviour change, as well as being informed by the analysis of clinician interviews.

Further development of the intervention and pilot testing in practice will help to confirm and refine the logic model as a part of the iterative process of the intervention research work.
Figure 3: logic model of pathway from intervention to effect on behaviour change applying components of the COM-B model
6.3 Guiding Principles for intervention development – the Person-based approach

In accordance with the Person-Based approach,

the above findings are presented as a process of creating guiding principles in Text box 1, below.

**Text box 1: Creating guiding principles for intervention development**

**Key outcome aims of the intervention:**
1. Reduced diagnostic uncertainty/ increased confidence in viral diagnosis
2. Reduced antibiotic prescribing / increased confidence not to prescribe

**Key findings relating to development of guiding principles for intervention development**
1. There is uncertainty as to whether the intervention is likely to have the desired effect on increasing confidence in viral diagnosis and reducing antibiotic prescribing behaviour
2. Clinicians largely did not believe their current prescribing practice needs to change
3. Without core ‘buy in’ from clinicians, time pressures and information overload are key barriers which would prevent clinicians engaging with the intervention (implementation)
4. Clinicians expressed a preference for risk (threat)-related information rather than reassurance
5. Clinicians were positive about sharing the intervention in the consultation to support patient explanation

**Key guiding principles for intervention development:**

*As the intervention effects are currently unknown, the focus is on encouraging clinician engagement (implementation) to facilitate the testing of the intervention impact on key outcomes:*

1. Ensure it is highly accessible – rapid presentation of key information and easy to access via ‘one click’
2. Consider carefully the inclusion of risk-related information to enhance clinician engagement without jeopardising the objectives of the intervention (i.e. there is potential for risk-related information to increase antibiotic prescribing behaviour)
3. Consider shifting the target intervention user group to nurse practitioners rather than GPs, which requires further research involving more nurse practitioners in the design, development and testing of the intervention
7 Chapter 7: Conclusion

GPs agreed that surveillance information is not routinely available in primary care and the planned infection surveillance intervention is novel in this context. There is evidence within clinician interviews of potential for both intervention implementation and impact, though the design, development and presentation to clinicians need to take account of the existing clinical context and the identified barriers in particular.

The research adds interesting knowledge around clinicians’ approach to clinical decision-making in that, although there was some allusion to probabilistic reasoning, clinicians on the whole felt they needed to make decisions by using their clinical expertise to assess the child as an individual. In this context, the reassurance-related information tended not to be viewed as helpful information, with some feeling that it could in fact introduce a greater risk of missing sick children, or somehow detract from their drive to make a full assessment, or be superfluous because they would still need to make a full assessment. This shows that, despite recommendations for epidemiological knowledge to form the starting point for diagnostic decision-making, clinicians may not be operating in this way with respect to paediatric RTI. Overall, clinicians seemed confident that their clinical expertise applied to assessing the individual child is the most reliable aspect of paediatric RTI management, and that they would primarily need information about changing risks in the environment to respond to, and do not need to change their current general approach.

7.1 Methodological considerations/ limitations

My role as the study manager for the infection surveillance feasibility study may have had an impact on the clinician interviews in that clinicians on the whole may have seen me as potentially invested in the intervention. There was also a wariness and defensiveness evident in some interviews (particularly the early ones) about my ability to assess whether clinicians were following guidelines, particularly in the context of a wide general knowledge of the problem of AMR. These factors may have contributed to clinicians’ self-presentations as not overprescribing, particularly in the context of being interviewed about a possible intervention with an explicit aim of reducing antibiotic prescribing. My role could have introduced demand characteristics about being more positive about the intervention, although from the
responses, it does not look like this was too much of an issue, given how freely clinicians gave negative opinions as well as positive.

This research mainly focused on GP responses as they formed the majority of participants, with only three NPs interviewed. This was on account of not many of the participating practices having NPs, and in practices that had them, there were fewer NPs than GPs to invite to interview, both of which contributed to this lower representation. It would have been interesting to interview more NPs to be able to make more comparisons between the two professional groups. There may be potential for gaining more NP opinions within the process evaluation of the pilot testing phase.

7.2 Implications

This research has reiterated previous literature about the clinical context of paediatric RTI management, particularly in identifying the continued focus of risk management and fear of missing the sick child, as well as contributing further evidence of the dual system approach to decision-making. What the research adds is an assessment of clinician responses to infection surveillance in this context. The research will directly impact on the practical development of the intervention as well as its underlying theory, but will also be relevant for other interventions.

In particular, it is interesting that public health information of a reassuring nature, increasing the probability of not needing to treat, is seen as something to be wary of in clinical decision-making, rather than to be embraced, perhaps even seeing it as detracting from, or competing with, their primary role in applying clinical expertise to assess each child as an individual. This finding emphasises clearly the theme of risk and a fear of missing the sick child, which seems to be the main contextual backdrop of paediatric RTI management.

This may be one of the biggest barriers for addressing clinician behaviour and over-prescribing in particular. That clinicians are so wary of missing the sick child and confident in their current practice that an intervention primarily designed to allay concerns (within a known clinical area of antibiotic over-prescription) is perceived as of either limited relevance, or at worst something to be avoided has implications for research around the major drivers of clinician decision-making and prescribing behaviour. This opens up potential for further work around the need for epidemiological assessment to aid reasoning in primary care.
That this work has indicated the possibility of a distinction between GPs’ and NPs’ responses to such an intervention is worth considering for future intervention development in the field of clinical decision-making. This is particularly worth exploring further in the current climate of increasing numbers of nurse practitioners working in primary care taking an increased proportion of consultations and decision-making responsibilities.

7.2.1 Further work

The purpose of the current research was to inform the intervention development, and as we have seen, is a part of a larger programme of research around developing and testing of an online surveillance intervention. This research will contribute to the development of the intervention, which, after PPI testing, will lead on to a pilot test of the developed intervention in clinic, with a plan to follow this with further intervention development and testing in a full randomised controlled trial. A part of the ongoing research will be to triangulate the clinician perspectives with the parent interviews for development of the parent-facing aspect of the intervention, and further develop and test the logic model and causal pathways of both intervention aspects. Future work is recommended to include more Nurse Practitioners as potential targets for interventions of this kind.

Beyond this immediate intervention development, a case could be made for research to explore further the implications of clinicians’ perspectives on public health information and probabilistic reasoning about reduced risk in the context of primary care clinical practice.

Further work could focus on getting beyond the ‘so what’ to the sense that there is something that it’s ‘gonna change’.
8 Chapter 8: Reflection

The current research developed from an initial remit of ‘qualitative interviews with clinicians’ within the EEPRIS feasibility study, to the current work presented here. From the initial idea of gaining GP perspectives on the proposed intervention, the work led to including nurse practitioners, exploring the existing clinical contextual background, and to the development of a logic model of the intervention causal pathway.

I feel that I have developed on the whole as a researcher in several ways. I have been through the process of NHS ethical application, and defended the research at a research ethics committee meeting. This process helped me learn to be very precise in my research planning, and think through all the ethical issues that could arise, and to be both organised and transparent in my development and revision of research documentation.

Within this research work, I have found that I developed my interviewing skills. In the earlier interviews I did not start by giving my professional background or a summary of the wider context of the research, going straight into questioning from the start. I was thinking I needed to save the clinician’s time, and that they would know enough context from reading the study information sheet. I felt, however, that this led to the first two interviewees (GP1 and GP2) being perhaps a little more defensive or wary in places when I questioned them, and recognised that the preamble was important both to build rapport, and to establish my identity in relation to the clinicians (as experts). In later interviews I began by giving a background about the wider (EEPRIS) feasibility study, and my role as project manager and health psychology trainee, emphasizing that I did not have a medical background and was keen to hear their experience and perspectives, encouraging genuine opinions (both positive and negative responses) as being most useful for the research.

I have enhanced my understanding of both how to approach qualitative research and how to approach intervention development and testing in research to maximise useful results and potential benefits. In particular I have learnt the importance of detailed preparatory work and PPI and stakeholder consultation in enhancing the value of the time spent interviewing clinicians. I recognise the importance of well-honed and focused questioning in contributing to the quality of the interview data collected. I have also developed skills in using nVivo for detailed coding of transcriptions, which I had not used before.

I have gained skills in project and people management in research, mainly from coordinating the wider EEPRIS feasibility study, but also within this nested qualitative research, as I had to
plan and request the budget for the work, keep the timing on track, organise and chair meetings with colleagues to disseminate my research plans and initial findings, arrange and budget for interview transcription from an outside company, maintain confidential records within the team, as well as support a more junior researcher (IL) in co-analysing interviews, talking through our coding together, and supporting her in conducting the final few interviews, as well as line managing an administrator (who helped with note-taking at meetings, and organising payment for clinician interviews).

I submitted the abstract of this work to present at the 2016 General Practice Research on Infections Network Meeting (GRIN) conference at the end of September, and it has been accepted for oral presentation. This opportunity will continue to develop my skills in communicating research findings to a wider audience, and in fielding questions about the work. I plan to submit the findings for publication before the end of the year. I have also secured an extra three months on my current contract for the purpose of developing the intervention for pilot testing, for which I will make close use of the current research findings.
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